

## Subject Categories of the Division C. Chemistry and Materials


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### **23 Chemistry and Materials (General) 25**

### **24 Composite Materials 26**

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see *27 Nonmetallic Materials*.

### **25 Inorganic and Physical Chemistry 33**

 Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also *77 Thermodynamics and Statistical Physics*.

### **26 Metallic Materials 45**

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

### **27 Nonmetallic Materials 57**

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

### **28 Propellants and Fuels 78**

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

### **29 Materials Processing N.A.**

Includes space-based development of products and processes for commercial application. For biological materials see *55 Space Biology*.

23  
**CHEMISTRY AND MATERIALS (GENERAL)**

**19980003982** Norwegian Defence Research Establishment, Kjeller, Norway

**Synthesis of Dialkyl Alkylphosphonates**

Haugan, J. A., Norwegian Defence Research Establishment, Norway; Bjerkeseth, L. H., Norwegian Defence Research Establishment, Norway; Johnsen, B. A., Norwegian Defence Research Establishment, Norway; Jun. 10, 1997; 42p; In English  
Report No.(s): PB97-209126; FFI/RAPPORT-97/00284; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Diethyl ethylphosphonate, diisopropyl ethylphosphonate, diisopropyl isopropylphosphonate, diethyl ethylphosphonate-d5 and diisopropyl ethylphosphonate-d5 were prepared in good yields (88-98%) and high purity (95-99%) by use of the Arbusov reaction. Problems were encountered with the Arbusov reaction when the reagent alkyl halide was less reactive than the alkyl halide formed during the course of the reaction. Diethyl ethylphosphonate and diethyl isopropylphosphate were prepared in low although acceptable yields (up to 28%) and reasonable purity (up to a ca 100%) by use of the Kosolapoff reaction. An unexpected by-product, isopropyl ethyl isopropylphosphate was formed in the reaction of sodium diethyl phosphite with isopropyl iodide. The generally low yields obtained by use of the Kosolapoff reaction in the present work are discussed and suggestions for improvements are given. An attempt to prepare dimethyl ethylphosphonate by the Hoffmann-Simmons-Glunz version of the Kinnear-Perren reaction was not successful. Neither was an attempt to prepare the same phosphonate from phosphorus oxychloride by use of a Grignard strategy. Complete <sup>1</sup>H NMR, <sup>13</sup>CNMR and <sup>31</sup>P NMR assignments, including coupling constants, are given for all the prepared phosphonates. Assignments generally based on <sup>1</sup>H-<sup>1</sup>H COSY and <sup>1</sup>H-<sup>1</sup>H COSY spectra.

NTIS

*Alkyl Compounds; Nuclear Magnetic Resonance; Phosphorus Compounds; Methyl Compounds; Isopropyl Compounds; Grignard Reactions; Ethyl Compounds*

**19980005211** NERAC, Inc., Tolland, CT USA

**Organic Semiconductors. (Latest citations from the INSPEC Database)**

May 1997; In English; Page count unavailable.

Report No.(s): PB97-859979; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning synthesis, structure, and properties of organic semiconductors for use in optoelectronics, integrated optics, solid state devices, and solar cells. References discuss semiconducting thin films, conjugated polymers, interfaces of organic semiconductors, self-doped polymer films, self-induced transparency, gas and chemical sensors, and color display.

NTIS

*Bibliographies; Semiconductors (Materials); Semiconductor Devices; Semiconducting Films*

**19980005237** NERAC, Inc., Tolland, CT USA

**Fire Retarding Coatings. (Latest citations from World Surface Coatings Abstracts)**

Aug. 1997; In English; Page count unavailable. Supersedes PB96-873005.

Report No.(s): PB97-862809; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning flame retardant coatings. Citations reference selected patents, chemical composition, surface preparations, applications, performance tests, and testing devices. Applications include use on wallpaper; electric wire and cable; cement based and hot-melt adhesive coatings; foaming fire retardants; and coatings for insulation, paint, putty, wood, and steel.

NTIS

*Bibliographies; Coatings; Abstracts; Flammability*

**19980005622** Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC USA

**Superfund Chemical Data Matrix, 1996**

Jun. 1996; 997p; In English

Report No.(s): PB96-963509; EPA/540/R-96/028; OSWER-9345.1-21; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Superfund Chemical Data Matrix (SCDM) is a source for factor values and benchmark values applied when evaluating potential National Priorities List (NPL) sites using the Hazard Ranking System. The HRS assigns factor values for toxicity, gas

migration potential, gas and ground water mobility, surface water persistence, and bioaccumulation potential based on the physical, chemical, and radiological properties of hazardous substances present at a site. Hazardous substances, as defined for HRS purposes, are CERCLA hazardous substances plus CERCLA pollutants and contaminants. The HRS also assigns extra weight to targets with exposure levels to hazardous substances that are at or above benchmarks. These benchmarks include both risk-based screening concentrations and concentrations specified in regulatory limits for the hazardous substances present at a site for a particular migration pathway.

NTIS

*Hazardous Materials; Chemical Compounds; Contaminants; Toxicity; Public Health; Risk; Environment Pollution*

**19980005669** Environmental Protection Agency, Atmospheric Research and Exposure Assessment Lab., Kansas City, KS USA  
**Matrix-Isolation Infrared and Low-Resolution Mass Spectra of the 209 Polychlorobiphenyl Congeners**

Miller, D. P., Environmental Protection Agency, USA; Kimball, H., Environmental Protection Agency, USA; Crone, T., Environmental Protection Agency, USA; Miller, B., ManTech, Inc., USA; Fairless, B. J., Environmental Protection Agency, USA; Feb. 1996; 225p; In English

Report No.(s): PB96-151188; EPA/600/R-96/002; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

There are 209 individual polychlorinated (PCBs), or congeners, that are derived from the commercial manufacture of polychlorinated biphenyl mixtures, such as the Aroclors. Although commercial production of PCBs in the United States ceased in 1977, they persist in the environment. Analytical reference spectra are needed for all 209 congeners in order to better interpret environmental monitoring data and assess potential risks to human health. The purpose of this report is to provide a reference library that may be used for the qualitative confirmation of individual PCB congeners observed in the human and environmental samples.

NTIS

*Mass Spectroscopy; Infrared Radiation; Chlorine Compounds; Chloroaromatics*

**19980006312** National Inst. of Standards and Technology, Boulder, CO USA

**Chemical Science and Technology Laboratory: Technical Activities, 1996**

Semerjian, H. G., National Inst. of Standards and Technology, USA; Hratchi, G., National Inst. of Standards and Technology, USA; Koch, W. F., National Inst. of Standards and Technology, USA; William, F., National Inst. of Standards and Technology, USA; 1996; 162p; In English

Report No.(s): PB97-192496; NISTIR-5995; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The report summarizes the research and services provided by the Chemical Science and Technology laboratory of the National Institute of Standards and Technology for Fiscal Year 1995. The report includes: a general overview of the laboratory's activities, a summary of the technical accomplishments in the five Chemical Science and Technology Laboratory (CSTL) divisions (Biotechnology, Process Measurements, Surface and Microanalysis, Physical and Chemical Properties, and Analytical Chemistry), and also description of 130 selected technical projects.

NTIS

*Research and Development; Biotechnology; General Overviews; Microanalysis*

## 24

### COMPOSITE MATERIALS

*Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.*

**19980003918** NERAC, Inc., Tolland, CT USA

**Adhesive Bonding of Composite Materials. (Latest citations from the Ei Compendex\*Plus Database)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-80606.

Report No.(s): PB97-852065; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the adhesive bonding of composite materials. Topics include x-ray stress analysis, mechanical properties, adhesion strength testing, surface treatments and preparations, and creep testing of bonded joints. A variety of adhesive materials are discussed with applications in the automotive and aircraft industries.

NTIS

*Adhesive Bonding; Bibliographies; Composite Materials; Mechanical Properties; Bonded Joints; Creep Tests; X Ray Stress Analysis*

**19980003936** NERAC, Inc., Tolland, CT USA

**Thermoplastic Composites: Recycling. (Latest citations from the Rubber and Plastics Research Association Database)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-858394.

Report No.(s): PB97-851935; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the recycling of thermoplastic composites. Multilayer thermoplastics, high density polyethylenes, polypropylenes, polycarbonates, and polyamides reinforced with fibers are considered. Granulators, recovery plants, and gasification of plastic waste are among the recycling techniques discussed.

NTIS

*Bibliographies; Thermoplastic Resins; Composite Materials; Scrap; Recycling*

**19980003987** NERAC, Inc., Tolland, CT USA

**Lightweight Armor (Latest citations from the US Patent Bibliographic File with Exemplary Claims)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851158; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning lightweight armor materials and structures. Citations describe body armor, bulletproof garments and vests, ballistic vests, and armor for vehicles and motorcyclists. The design and fabrication of laminated, composite, polymer, ceramic, and aluminum armor materials are presented.

NTIS

*Armor; Bibliographies; Aluminum; Fabrication*

**19980004072** Wright State Univ., Dept. of Mechanical and Materials Engineering, Dayton, OH USA

**Mechanical Behavior and Flow Mechanisms in Refractory Metal Composites *Final Report, 1 Mar. 1990 - 30 Sep. 1993***

Weiss, I., Wright State Univ., USA; Srinivasan, R., Wright State Univ., USA; Apr. 29, 1994; 51p; In English

Contract(s)/Grant(s): AF-AFOSR-0204-90; AF Proj. 3484

Report No.(s): AD-A329833; AFOSR-TR-97-0495; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report clearly demonstrates that the mechanical behavior of a refractory metal based composite, such as Nb-10 a/o Si alloy, can be improved considerably by tailoring the microstructure through thermomechanical processing (TMP). This desired microstructure consists of a fine grain silicide matrix reinforced with polygrain Nb particles which are elongated, oriented and aligned in a direction transverse to crack propagation. The powder processing route can achieve a fine grain structure which would exhibit high strength. But, significant improvements in fracture toughness would probably not be possible because factors such as the elongation, alignment, and orientation of the ductile reinforcement phase are critical and provide additional energy absorption mechanisms such as pull-out, interface sliding, and crack bridging. The directional solidification (DS) process can produce a composite with reinforcing phase particles of specific size, spacing, and orientation. However, in the DS material, both the matrix and the ductile particles have single grain structures, which are prone to cleavage. Therefore, TMP by hot extrusion of a DS material will result in a composite with optimum properties.

DTIC

*Refractory Metals; Metal Matrix Composites; Microstructure; Thermomechanical Treatment; Extruding*

**19980004152** Alabama Univ., Center for Automation and Robotics, Huntsville, AL USA

**Study of Acoustic Emissions from Composites *Final Report***

Walker, James L., Alabama Univ., USA; Workman, Gary L., Alabama Univ., USA; Dec. 1997; 51p; In English

Contract(s)/Grant(s): NAS9-38609

Report No.(s): NASA/CR-97-206452; NAS 1.26:206452; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The nondestructive evaluation (NDE) of future propulsion systems utilizing advanced composite structures for the storage of cryogenic fuels, such as liquid hydrogen or oxygen, presents many challenges. Economic justification for these structures requires light weight, reusable components with an infrastructure allowing periodic evaluation of structural integrity after enduring demanding stresses during operation. A major focus has been placed on the use of acoustic emission NDE to detect propagating defects, in service, necessitating an extensive study into characterizing the nature of acoustic signal propagation at very low temperatures and developing the methodology of applying AE sensors to monitor cryogenic components. This work addresses the question of sensor performance in the cryogenic environment. Problems involving sensor mounting, spectral response and dura-

bility are addressed. The results of this work provides a common point of measure from which sensor selection can be made when testing composite components at cryogenic temperatures.

Author

*Acoustic Emission; Nondestructive Tests; Composite Structures; Cryogenic Temperature*

**19980004531** National Physical Lab., Centre for Materials Measurement and Technology, Teddington, UK

**Measuring the Dimensional Stability of Composites**

Lord, J. D., National Physical Lab., UK; May 1997; 8p; In English

Report No.(s): PB97-198246; NPL-CMMT-(MN)-014; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This measurement note provides a brief summary of an NPL report reviewing methods for measuring the dimensional stability of metal and ceramic matrix composites. A number of measurement techniques are reviewed including simple mechanical measuring instruments, electrical transducers and optical techniques, with some comment on extensometry, coordinate measuring machines, fibre optic systems, laser and Moire interferometry and image correlation techniques. The review covers some of the merits and practical issues of the different techniques, their suitability for testpieces and components and whether the techniques can be used under normal in-service conditions or through periodic inspection tests.

NTIS

*Dimensional Stability; Ceramic Matrix Composites; Metal Matrix Composites*

**19980004573** Oak Ridge National Lab., TN USA

**Thermal diffusivity mapping of 4D carbon-carbon composites**

Wang, H., Oak Ridge National Lab., USA; Dinwiddie, R. B., Oak Ridge National Lab., USA; [1997]; 9p; In English; 21st; Annual Cocoa Beach Conference and Exposition, 12-16 Jan. 1997, Cocoa Beach, FL, USA

Contract(s)/Grant(s): DE-AC05-96OR-22464

Report No.(s): CONF-970159-2; DE97-003485; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

High resolution, 2-D thermal diffusivity maps of carbon-carbon composites were obtained by a state-of-the-art infrared thermal imaging system. Unlike the traditional single-point IR detector used for thermal diffusivity measurements, the IR camera is capable of capturing images in its 256 x 256 pixel Focal Plane Array detector in a snap-shot mode. The camera takes up to 200 images at a rate of 120 frames/second. The temperature resolution of the IR camera is 0.015 C and the spatial resolution is 20 (micro)m. Thermal diffusivity was calculated for each pixel. Four-direction carbon-carbon composites were used for the thermal diffusivity mapping study. The fiber bundles along the heat flow direction were found to have 25% higher diffusivity values than the surrounding matrix. The diffusivity map also showed detailed local variations in diffusivity which were impossible to measure using a single-point detector. Accurate diffusivity maps are very important to the design of composite materials.

DOE

*Carbon-Carbon Composites; Infrared Detectors; Infrared Imagery; Spatial Resolution; Thermal Diffusivity; Thermal Mapping*

**19980004604** NERAC, Inc., Tolland, CT USA

**Developments in Reinforcing Fibers: Carbon and Graphite. (Latest citations from Engineered Materials Abstracts)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-862818

Report No.(s): PB97-854996; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning developments in carbon and graphite reinforcing fibers. References discuss market and technology trends, new fibers and their production methods, fiber surface preparation methods, and application to new composite materials. New developments in glass fibers are discussed in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Reinforcing Fibers; Graphite; Carbon Fibers*

**19980004747** Los Alamos National Lab., NM USA

**P-31 NMR study of the complexation of TBP with lanthanides and actinides in solution and in a clay matrix**

Hartzell, C. J., University of Northern Arizona, USA; Jul. 24, 1994; 9p; In English

Contract(s)/Grant(s): W-7405-eng-36



Report No.(s): LA-Sub-94-123; DE97-002583; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Goal was to use NMR to study TBP/lanthanide complexes in the interlayer or on edge sites of clays. Work in this laboratory yielded details of the complexation of  $\text{Eu}(\text{NO}(\text{sub } 3))(\text{sub } 3)$  and  $\text{Pr}(\text{NO}(\text{sub } 3))(\text{sub } 3)$  with TBP in hexane solution; this information is crucial to interpretation of results of NMR studies of the complexes exchanged into clays. The solution (sup 31)P-chemical shift values were improved by repeating the studies on the lanthanide salts dissolved directly into neat TBP. NMR studies of these neat solutions of the  $\text{Eu}(\text{NO}(\text{sub } 3))(\text{sub } 3)(\text{lg bullet})3\text{TBP}$ -complex and the  $\text{Pr}(\text{NO}(\text{sub } 3))(\text{sub } 3)(\text{lg bullet})3\text{TBP}$ -complex show that the (sup 31)P chemical shift remains relatively constant for TBP: lanthanide ratios below 3: 1. At higher ratios, the chemical shift approaches that of free TBP, indicating rapid exchange of TBP between the free and complexed state. Exchange of these complexes into the clay hectorite yielded discrete (sup 31)P-NMR signals for the  $\text{Eu}(\text{lg bullet})\text{TBP}$  complex at -190 ppm and free TBP at -6 ppm. Adsorption of the  $\text{Pr}(\text{lg bullet})\text{TBP}$  complex yielded broad signals at 76 ppm for the complex and -6 ppm for free TBP. There was no evidence of exchange between the incorporated complex and the free TBP.

DOE

*Clays; Nuclear Magnetic Resonance; Chemical Equilibrium*

**19980004784** NERAC, Inc., Tolland, CT USA

**Automation in Processing Composites: Testing and Quality Control. (Latest citations from Engineered Materials Abstracts)**

May 1997; In English; Page count unavailable. Supersedes PB96-863113.

Report No.(s): PB97-860472; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning automated inspection and quality assurance techniques used in composite materials processing. Citations discuss robotics, fuzzy logic, and intelligent systems used in Quality Control and Nondestructive testing. Technologies and equipment include ultrasonics, x-rays, and smart structures. Automation in molding of composite materials and in forming of composite materials is covered in separate bibliographies.

NTIS

*Bibliographies; Molding Materials; Smart Structures; Robotics; Fuzzy Systems; X Rays; Ultrasonics*

**19980004822** NERAC, Inc., Tolland, CT USA

**Microsphere Fillers. (Latest citations from the Rubber and Plastics Research Association Database)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-855549.

Report No.(s): PB97-851729; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning properties and uses of microspheres as fillers in a variety of polymeric materials. The effects of the addition of microspheres on the mechanical and rheological properties of polymer products are examined. Microspheres fabricated from glass, polymers, and ceramics are considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Fillers; Reinforced Plastics*

**19980004826** Toledo Univ., Dept. of Mechanical, Industrial and Manufacturing Engineering, OH USA

**Computational Simulation of Composite Behavior Final Report, 30 Nov. 1991 - 2 Nov. 1996**

Keith, Theo G., Jr., Toledo Univ., USA; Mital, Subodh K., Toledo Univ., USA; Dec. 1997; 3p; In English

Contract(s)/Grant(s): NAG3-1264

Report No.(s): NASA/CR-97-112952; NAS 1.26:112952; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Composite microfracture technique developed here is based on the concept of global strain energy release rate. Step-by-step procedures were outlined to evaluate composite microfracture. The technique can predict microfracture initiation/propagation, predict the "structural fracture toughness", and establish the hierarchy of fracture modes. Both unidirectional and cross-ply metal-matrix composite laminates were evaluated for microfracture, subjected to thermal and mechanical loads. Five NASA reports were published as shown in the bibliography and several presentations were made at the technical conferences/ symposia. Work was also performed to develop simplified micromechanics and macromechanics for ceramic matrix composites. A novel fiber sub-structuring technique was developed, which divides the fiber into several "slices" and applies the micromechanics equation at the "slice" level, which are then integrated upwards to get the ply and the laminate properties. It allows for a more accurate representation of interfacial conditions such as partial interface bond etc. It also predicts the stress-strain behavior of a composite

up to failure by taking into account material properties dependence upon temperature as well as stress redistribution that occurs due to damage initiation and propagation. A computer code CEMCAN (Ceramic Matrix Composites Analyzer) which includes all these capabilities has been developed as a part of this research activity.

Derived from text

*Ceramic Matrix Composites; Fractures (Materials); Crack Initiation; Micromechanics; Strain Energy Release Rate; Stress-Strain Relationships; Metal Matrix Composites; Fracture Strength; Simulation; Microcracks*

**19980004831** Texas A&M Univ., Dept. of Aerospace Engineering, College Station, TX USA

**Thermomechanical Analysis of Carbon-Carbon Composites Evaluation Report Final Report, 15 Aug. 1993 - 14 Aug 1997**

Whitcomb, John, Texas A&M Univ., USA; Ochoa, Ozden, Texas A&M Univ., USA; Aug. 1997; 5p; In English

Contract(s)/Grant(s): F49620-93-I-0471

Report No.(s): AD-A330014; AFOSR-TR-97-0509; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A three-dimensional progressive failure analysis was developed to predict the stiffness and strength of oxidation-resistant carbon-carbon composites subjected to thermal and mechanical loads. Both plain and satin weave composites were studied. A continuum damage modeling strategy was used. However, the shapes of the predicted zones often were 'crack-like'. The tow crossover region was identified as a critical region for damage initiation. Matrix cracking and debonding between the tows was predicted. The fiber architecture was shown to have a large influence on stiffness, when damage occurred, and the type of damage. The analysis provides detailed information about damage initiation and growth. Of course, the predictions can be no better than the input data. The current program developed key analytical capabilities and demonstrated the sensitivity of the CC composite behavior to various parameters. To go further will require improved experimental data that will either validate the analysis or indicate aspects that require refinement.

DTIC

*Evaluation; Technologies; Three Dimensional Models; Carbon-Carbon Composites; Thermodynamics*

**19980004903** NERAC, Inc., Tolland, CT USA

**Particle Boards and Fiberboards: Fabrication, Use, and Properties . (Latest citations from the NTIS Bibliographic Database)**

Oct. 1996; In English; Page count unavailable. Supersedes PB81-806903.

Report No.(s): PB97-850069; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning research on the development, fabrication, and performance of particle boards and fiberboards. Citations review performance oriented packaging tests and certifications. Other subjects include testing under hypothetical accident conditions, thermophysical property models, and effluent limitation guidelines. Producer and consumer benefits, employment impacts, and packaging of hazardous materials are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Fabrication; Boards (Paper)*

**19980005114** Northwestern Univ., Center for Quality Engineering and Failure Prevention, Evanston, IL USA

**High Temperature Heterogeneous Materials Final Report, 15 Jan. 1990 - 31 Aug. 1993**

Keer, Leon M., Northwestern Univ., USA; Faber, K. T., Northwestern Univ., USA; Moran, B., Northwestern Univ., USA; Weertman, J., Northwestern Univ., USA; Jul. 22, 1994; 26p; In English

Contract(s)/Grant(s): AF-AFOSR-0237-90

Report No.(s): AD-A329853; AFOSR-TR-97-0494; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experimental and supporting analytical methodologies for the determination and assessment of the integrity of interfaces in composite materials at both room and high temperatures are presented. Experimental test techniques developed in the program are described and supporting analytical methods to assist in the determination of interface fracture toughness from experimental measurements are presented. The test techniques consist of the tensile test on a thin coated fiber and four point bend of a bimaterial bar and were chosen on the basis of their suitability for use at high temperatures. An experimental study of crack tip shielding/anti-shielding by impurities in alpha-silicon carbide is described. This investigation required the application of stress during high temperature (1873 K) anneals. A novel stress fixture, based on thermal expansion mismatch, was designed, constructed and utilized to achieve this in-situ stressing of the crack specimens at high temperatures.

DTIC

*Tensile Tests; Bend Tests; High Temperature Tests; Refractory Materials; Composite Materials*

**19980005115** Engineering Societies Library, New York, NY USA

**Processing and Design Issues in High Temperature Materials Final Report**

Stoloff, N. S., Engineering Societies Library, USA; Jone, R. H., Engineering Societies Library, USA; Jul. 01, 1997; 431p; In English

Contract(s)/Grant(s): F49620-96-I-0203

Report No.(s): AD-A329848; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

The Engineering Foundation Conference on Processing and Design Issues in High Temperature Materials was held in Davos, Switzerland, 19-24, 1996. Approximately fifty participants represented academic institutions, industrial research laboratories and government organizations. The goal of the conference was to exchange areas of common concern among developers and users of high temperature materials of differing types, including superalloys, ceramics, intermetallics and composites. Levels of design ranging from atomic theory to processing techniques were covered in nine oral technical sessions and a poster session. The keynote lecture, entitled "Implementation Challenges for High Temperature Composites" was followed by 26 invited and 15 contributed papers, of which four were poster presentations. The participants were noteworthy for the wide range of their technical specialties. It was evident that many participants were exposed to relatively unfamiliar materials and topics as a result of efforts by the organizing committee to have an extremely diverse group of conferees. Since superalloys dominate current high temperature applications in the 800-1100 C range, it was considered to be important to discuss alloy design principles, microstructures and mechanical properties of potentially competitive materials such as ceramics and intermetallics, as well as their composites. Environmental effects on mechanical properties were highlighted; it was shown, for example, that water vapor can be detrimental to both intermetallics at low temperatures and ceramics at high temperatures. Oxidation of high temperature materials was another environmental issue of great importance that was discussed in several papers.

DTIC

*Refractory Materials; Composite Materials; Conferences; High Temperature Environments*

**19980005126** Denver Univ., Center for Advanced Materials and Structures, Denver, CO USA

**Biaxial Failure Analysis of Graphite Reinforced Polyimide Composites Final Report, 15 Mar. 1995 - 30 May 1996**

Kumosa, Maciej S., Denver Univ., USA; Searles, Kevin H., Oregon Graduate Inst. of Science and Technology, USA; Odegard, Greg, Denver Univ., USA; Thirumalai, V., Oregon Graduate Inst. of Science and Technology, USA; Nov. 15, 1996; 12p; In English  
Contract(s)/Grant(s): F49620-96-I-0314; NSF CMS-96-96160

Report No.(s): AD-A329883; AFOSR-TR-97-0343; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Three issues have been addressed in this report. Firstly, the biaxial shear dominated failure properties of graphite/polymid fabric composites have been investigated at room temperature using the biaxial Iosipescu method. Secondly, a new testing procedure has been suggested for evaluating micro-damage in polymer matrix composites. Using this method, three-dimensional failure characteristics of damage generated in the graphite/polymid Iosipescu specimens can be determined for various loading conditions. Finally, non-linear finite element computations of internal stresses in the Iosipescu specimens have been performed taking into account the effect of specimen sliding within the Iosipescu fixture.

DTIC

*Failure Analysis; Finite Element Method; Nonlinearity; Polyimides; Polymer Matrix Composites; Residual Stress; Room Temperature*

**19980005142** Transportation Research Board, IDEA Program, Washington, DC USA

**Basalt Fiber Composite Reinforcement for Concrete Final Report**

Brik, V. B., Transportation Research Board, USA; Mar. 1997; 22p; In English

Report No.(s): PB97-161335; TRB/NCHRP-ID025; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project explored the feasibility of using rebars made from braided fiber strands as concrete reinforcement. The basalt fibers were produced using a process developed in Ukraine. Continuous basalt fibers, 9-15 micron in diameter, were determined to be most suitable for rebar fabrication. The rebars consist of about 80-90% fibers and an organic binder. Tests results for mechanical properties (strength and modulus) appear to establish the suitability of basalt composite rebars for use as concrete reinforcement.

NTIS

*Concretes; Braided Composites; Reinforcing Fibers*

**19980005214** NERAC, Inc., Tolland, CT USA

**Adhesive Bonding of Composite Materials. (Latest Citations from the NTIS Bibliographic Database)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-859210



Report No.(s): PB97-854541; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the adhesive bonding of composite materials. Topics include x-ray stress analysis, mechanical properties, adhesion strength testing, surface treatments and preparations, and creep testing of bonded joints. Various adhesive materials are discussed with applications in the automotive and aircraft industries. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Adhesive Bonding; Composite Materials*

**19980005221** Technische Hogeschool, Dept. of Electrical Engineering, Eindhoven, Netherlands

**Oscillating Boundary Layers in Polymer Extrusion**

Molenaar, J., Technische Hogeschool, Netherlands; Mar. 1996; 30p; In English; Figures in this document may not be legible in microfiche

Report No.(s): PB97-176309; RANA-96-05; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the report, the authors investigate the sharkskin effect. The observations indicate that the typical pattern of ridges is the result of an oscillating boundary layer. In the report, the authors shall show an explanation which does not invoke the violation of the 'classical' stick condition. The analyses are given for two visco-elastic models, the Kaye-Bernstein-Kersly-Zapas (KBKZ) model and the Johnson-Segalman-Oldroyd (JSO) model. The relevant conservation laws are presented and the resulting equations are brought into dimensionless form. It is shown that for low values of the pressure these constant solutions are unique, but that for pressure values above a critical one, infinitely many constant solutions. It is shown that some of them have an oscillating boundary layer. It is discussed that such solutions are a highly appropriate explanation of the occurrence of sharkskin.

NTIS

*Boundary Layers; Conservation Laws; Dimensionless Numbers*

**19980005594** NERAC, Inc., Tolland, CT USA

**Advanced Composites for Aerospace Applications (Latest citations from the Ei Compindex\*Plus Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870308; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, and evaluation of advanced composites and structures used in aircraft, spacecraft, and rockets. Citations discuss metal-matrix, polymer-matrix, fiber-reinforced, carbon-carbon, ceramic, high-density, lightweight, and superplastic composites. Topics include aeroelastic and structural analysis, mechanics of composites, environmental assessment of composites, reliability, and service life. International trade, non-aerospace markets, and health and safety issues are examined.

NTIS

*Bibliographies; Composite Materials; Composite Structures; Structural Analysis; Carbon-Carbon Composites; Ceramic Matrix Composites; Fiber Composites; Fabrication*

**19980005618** National Defence Research Establishment, Huvudavdelning foer ABC-Skydd, Umea, Sweden

**Toxicity of Composite Material from JAS 39 Gripen Toxstudie av Kompositmaterial fran JAS 39 Gripen**

Svensson, I., National Defence Research Establishment, Sweden; Artursson, E., National Defence Research Establishment, Sweden; Dec. 1995; 38p; In Swedish

Report No.(s): PB97-101687; FOA-R-95-00165-4.5-SE; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Grinding dust from repair work of the aircraft JAS39 Gripen was investigated regarding size and size distribution of particles and with respect to toxicity in vitro. The results were compared to the toxicity of crocidolit (asbestos). The toxicity of the composite material was found to be low.

NTIS

*Composite Materials; Toxicity; Dust; JAS-39 Aircraft*

**19980006070** NASA Langley Research Center, Hampton, VA USA

**The Characteristics of Fatigue Damage in the Fuselage Riveted Lap Splice Joint**

Piasek, Robert S., NASA Langley Research Center, USA; Willard, Scott A., Lockheed Engineering and Sciences Co., USA; Nov. 1997; 376p; In English

Contract(s)/Grant(s): RTOP 538-02-10-01

Report No.(s): NASA/TP-97-206257; L-17637; NAS 1.60:206257; No Copyright; Avail: CASI; A17, Hardcopy; A03, Microfiche

An extensive data base has been developed to form the physical basis for new analytical methodology to predict the onset of widespread fatigue damage in the fuselage lap splice joint. The results of detailed destructive examinations have been cataloged to describe the physical nature of MSD in the lap splice joint. The catalog includes a detailed description, e.g., crack initiation, growth rates, size, location, and fracture morphology, of fatigue damage in the fuselage lap splice joint structure. Detailed examinations were conducted on a lap splice joint panel removed from a full scale fuselage test article after completing a 60,000 cycle pressure test. The panel contained a four bay region that exhibited visible outer skin cracks and regions of crack link-up along the upper rivet row. Destructive examinations revealed undetected fatigue damage in the outer skin, inner skin, and tear strap regions. Outer skin fatigue cracks were found to initiate by fretting damage along the faying surface. The cracks grew along the faying surface to a length equivalent to two to three skin thicknesses before penetrating the outboard surface of the outer skin. Analysis of fracture surface marker bands produced during full scale testing revealed that all upper rivet row fatigue cracks contained in a dim bay region grow at similar rates; this important result suggests that fracture mechanics based methods can be used to predict the growth of outer skin fatigue cracks in lap splice structure. Results are presented showing the effects of MSD and out-of-plane pressure loads on outer skin crack link-up.

Author

*Data Bases; Fatigue (Materials); Riveted Joints; Fuselages; Damage; Full Scale Tests; Lap Joints; Fracture Mechanics; Cracks*

**19980006076** Analytical Services and Materials, Inc., Hampton, VA USA

**Honeycomb Core Permeability Under Mechanical Loads**

Glass, David E., Analytical Services and Materials, Inc., USA; Raman, V. V., Analytical Services and Materials, Inc., USA; Venkat, Venki S., Analytical Services and Materials, Inc., USA; Sankaran, Sankara N., Analytical Services and Materials, Inc., USA; Dec. 1997; 26p; In English

Contract(s)/Grant(s): NAS1-20013; RTOP 538-13-11-02

Report No.(s): NASA/CR-97-206263; NAS 1.26:206263; AS/M-R53-97-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A method for characterizing the air permeability of sandwich core materials as a function of applied shear stress was developed. The core material for the test specimens was either Hexcel HRP-3/16-8.0 and or DuPont Korex-1/8-4.5 and was nominally one-half inch thick and six inches square. The facesheets were made of Hercules' AS4/8552 graphite/epoxy (Gr/Ep) composites and were nominally 0.059-in. thick. Cytac's Metalbond 1515-3M epoxy film adhesive was used for co-curing the facesheets to the core. The permeability of the specimens during both static (tension) and dynamic (reversed and non-reversed) shear loads were measured. The permeability was measured as the rate of air flow through the core from a circular 1-in<sup>2</sup> area of the core exposed to an air pressure of 10.0 psig. In both the static and dynamic testing, the Korex core experienced sudden increases in core permeability corresponding to a core catastrophic failure, while the URP core experienced a gradual increase in the permeability prior to core failure. The Korex core failed at lower loads than the HRP core both in the transverse and ribbon directions.

Author

*Honeycomb Cores; Graphite-Epoxy Composites; Permeability; Mechanical Properties; Shear Stress; Gas Pressure; Loads (Forces); Air Flow; Curing*

**25**

**INORGANIC AND PHYSICAL CHEMISTRY**

*Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.*

**19980003917** NERAC, Inc., Tolland, CT USA

**Proton Exchange Membranes. (Latest citations from the Energy Science and Technology Database)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-861190.

Report No.(s): PB97-852081; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the characterization and applications of proton exchange membranes. Articles discuss the design, development, and testing of proton exchange materials with emphasis on use as a fuel cell separator. Citations also discuss performance modeling, inclusive of water and thermal management.

NTIS

*Bibliographies; Fuel Cells; Membranes; Protons; Energy Technology*

**19980003958** National Inst. of Standards and Technology, Physics Lab., Gaithersburg, MD USA

**Workshop on Raman Spectroscopy in Optical and Materials Sciences**

Weber, A., Editor, National Inst. of Standards and Technology, USA; Dec. 10, 1996; 95p; In English; Workshop on Raman Spectroscopy in Optical and Materials Sciences, 10 Dec. 1996, Gaithersburg, MD, USA

Report No.(s): PB97-206015; NISTIR-6032; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Topics considered include: Developments and Applications in Raman Spectroscopy; Applications of Raman Spectroscopy to Polymer Science and Technology; Near-IR FT-Raman Microspectroscopy of Two Materials Systems - CVD Diamond and Zirconia Ceramics; Structure and Spectroscopy of Cycliosilicate Materials; Effect of Doping on the Electronic Raman Spectrum of Cuprate Superconductors; Raman Spectroscopy of Ultrathin Organic Films and Ceramic Precursors; Raman Spectroscopy of Semiconductor Heterostructures - Phonons and Excitons as Probes of Interfaces; and Magneto-Raman Spectroscopy at NIST - A Raman Laboratory User Facility.

NTIS

*Conferences; Materials Science; Raman Spectroscopy*

**19980004074** Pacific Northwest Lab., Richland, WA USA

**Stability constant estimator user's guide**

Hay, B. P., Pacific Northwest Lab., USA; Castleton, K. J., Pacific Northwest Lab., USA; Rustad, J. R., Pacific Northwest Lab., USA; Dec. 1996; 50p; In English

Contract(s)/Grant(s): DE-AC06-76RL-01830

Report No.(s): PNNL-11434; DE97-051566; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of the Stability Constant Estimator (SCE) program is to estimate aqueous stability constants for 1:1 complexes of metal ions with ligands by using trends in existing stability constant data. Such estimates are useful to fill gaps in existing thermodynamic databases and to corroborate the accuracy of reported stability constant values.

DOE

*Statistical Analysis; Stability; Data Bases*

**19980004076** Sandia National Labs., Albuquerque, NM USA

**Hydrothermal oxidation of Navy shipboard excess hazardous materials**

LaJeunesse, C. A., Sandia National Labs., USA; Haroldsen, B. L., Sandia National Labs., USA; Rice, S. F., Sandia National Labs., USA; Brown, B. G., Sandia National Labs., USA; Mar. 1997; 49p; In English

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-8212; DE97-052275; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This study demonstrated effective destruction, using a novel supercritical water oxidation reactor, of oil, jet fuel, and hydraulic fluid, common excess hazardous materials found on-board Navy vessels. This reactor uses an advanced injector design to mix the hazardous compounds with water, oxidizer, and a supplementary fuel and it uses a transpiring wall to protect the surface of the reactor from corrosion and salt deposition. Our program was divided into four parts. First, basic chemical kinetic data were generated in a simple, tubular-configured reactor for short reaction times (less than 1 second) and long reaction times (greater than 5 seconds) as a function of temperature. Second, using the data, an engineering model was developed for the more complicated industrial reactor mentioned above. Third, the three hazardous materials were destroyed in a quarter-scale version of the industrial reactor. Finally, the test data were compared with the model. The model and the experimental results for the quarter-scale reactor are described and compared in this report. A companion report discusses the first part of the program to generate basic chemical kinetic data. The injector and reactor worked as expected. The oxidation reaction with the supplementary fuel was initiated between 400 (degrees)C and 450 (degrees)C. The released energy raised the reactor temperature to greater than 600 (degrees)C.

At that temperature, the hazardous materials were efficiently destroyed in less than five seconds. The model shows good agreement with the test data and has proven to be a useful tool in designing the system and understanding the test results.

DOE

*Chemical Reactions; Hazardous Materials; Reaction Kinetics; Oxidizers*

**19980004514** Stiftelsen foer Vaermeteknisk Forskning, Stockholm, Sweden

**Bed agglomeration in biomass fueled CFB-boilers** *Sintring av baeddmateriel vid biobraensleeldning i CFB*

Zintl, F., TPS Termiska Processer A.B., Sweden; Feb. 1997; ISSN 0282-3772; 48p; In Swedish

Contract(s)/Grant(s): Vaermeforsk-O3-507

Report No.(s): SVF-604; DE97-740810; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

In fluidized-bed boilers fired with solid fuels operational problems caused by spontaneous defluidization are sometimes observed. This bed agglomeration can be caused by sintering phenomena where fuel components and/or bed material may be involved. In serious cases the problems can lead to expensive operation breaks. The objective in this project was to show whether this type of operational problems can be minimized by choice of other than conventional bed materials. The study was carried out as model experiments in a larger laboratory scale. In a fluidized bed fired with propane a number of both well known and more unusual bed materials were tried out. The choice of bed materials included some common sands (silver and quartz sand) and, as possible alternatives, olivine sand, zirconium sand, calcined dolomite and the synthetic materials sintered magnesite (MgO) and mullite (alumina silicate). The model experiments were started at about 700 deg C and the temperature then raised until an irreversible bed agglomeration was observed, or to a maximum of 1100 deg C. The most promising results were obtained with calcined dolomite, being an active bed material. With this material no irreversible agglomerations were observed at all. The expensive synthetic materials sintered magnesite and mullite and the zirconium sand turned out as the next best. Olivine sand, on the other hand, showed a clear sensitivity to physical agglomeration and some sensitivity also towards sintering. The common sand types based on silicon oxide clearly showed the worst results.

DOE

*Agglomeration; Aluminum Oxides; Boilers; Dolomite (Mineral); Magnesium Oxides; Mullites; Olivine*

**19980004586** Los Alamos National Lab., NM USA

**Thermal aging of LaNi(5-x)Mn(x) hydrides**

Bagchi, S., Nevada Univ., USA; Chandra, D., Nevada Univ., USA; Cathey, W. N., Nevada Univ., USA; 1997; 13p; In English; 126th; Minerals, Metals and Materials Society, 9-13 Feb. 1997, Orlando, FL, USA

Contract(s)/Grant(s): W-7405-eng-36

Report No.(s): LA-UR-96-4084; CONF-970201-11; DE97-003128; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The LaNi(sub 5-x)Mn(sub x)-hydrides have potential applications in cryocooling devices for non-mechanical method to compress hydrogen gas. Thermal aging behavior of LaNi(sub 5-x)Mn(sub x)-hydrides of compositions x=0.4 and x=1.5 has been investigated. The hydriding properties of the La(sub 1.02)Ni(sub 4.6)Mn(sub 0.4) alloy do not change significantly after thermal aging at 453K for 260 hours. X-ray diffraction analyses of this aged alloy do not reveal the presence of any new phases but the Bragg peaks become broader. Line profile analyses show anisotropic microstrains with an average  $\langle \epsilon^2 \rangle^{1/2}$  value of (approximately)  $5 \times 10^{-3}$ . Thermal aging of the other hydride, LaNi(sub 3.5)Mn(sub 1.5) hydride, at 623K for 280 hours, showed significant disproportionation; the hydrogen capacity reduced significantly from an H/M value of 0.75 in the activated condition to (approximately) 0.15 after aging. X-ray diffraction analyses showed disproportionated lanthanum dihydride, metallic Ni, and Mn phases. The Bragg peaks were very broad indicative of microstrains or small crystalline domains.

DOE

*Lanthanum; Hydrides; Aging (Materials); Crystallinity; X Ray Diffraction*

**19980004591** Argonne National Lab., IL USA

**The influence of hindered rotations on recombination/dissociation kinetics**

Wagner, A. F., Argonne National Lab., USA; Harding, L. B., Argonne National Lab., USA; Robertson, S. H., Leeds Univ., UK; Wardlaw, D.M., Queens Univ., Canada; 1996; 29p; In English; International Bunsen Discussion Meeting on Unimolecular Reactions, 21-24 Oct. 1996, Tutzing, Germany

Contract(s)/Grant(s): W-31-109-eng-38

Report No.(s): ANL/CHM/CP-92087; CONF-9610111-2; DE97-001975; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The variational canonical flexible transition state theory expressions for the thermal reaction rate constant are reviewed and then applied to the barrier-less recombination reactions H+CCH, H+CF(sub 3), and CH+H(sub 2). The rate constant expressions can classically accommodate any description of the hindering potential governing relative orientation changes between the reactants at a given distance. The distance held fixed during the relative orientation changes can be fully optimized. The three applications display comparable and large variations between the harmonic oscillator and free rotor limits of the hindering potential. The actual hindering potentials are all derived from similar ab initio electronic structure calculations. With these potentials, the rate constant for H+CF(sub 3) is somewhat free-rotor like, the rate constant for CH+H(sub 2) is mostly harmonic-oscillator like, and the rate constant for H+CCH is largely in between these two limits.

DOE

*Chemical Reactions; Reaction Kinetics; Recombination Reactions; Harmonic Oscillators*

**19980004599** Centre d'Etudes de Grenoble, Dept. de Recherche Fondamentale sur la Matiere Condensee, Grenoble, France

**Magnetic properties of Np2T2Sn compounds**

Sanchez, J. P., Centre d'Etudes de Grenoble, France; Colineau, E., Centre d'Etudes de Grenoble, France; Jeandey, C., Centre d'Etudes de Grenoble, France; Oddou, J. L., Centre d'Etudes de Grenoble, France; Rebizant, J., Commission of the European Communities, Germany; Seret, A., Commission of the European Communities, Germany; Spirlet, J. C., Commission of the European Communities, Germany; 1994; 9p; In English; International Conference on Strongly Correlated Electron Systems, 15-18 Aug. 1994, Amsterdam, Netherlands

Report No.(s): CEA-CONF-12131; CONF-940863-; DE97-620213; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The magnetic properties of the Np2T2Sn series investigated by Np-237 Moessbauer spectroscopy are reported. Magnetic ordering is shown to occur for T = Ni, Pd, Pt, whereas the Np ions do not carry a local moment when T = Co, Ru, Rh. Comparison is made with the corresponding Np2T2In and U2T2Sn compounds.

DOE

*Magnetic Properties; Intermetallics; Actinide Series*

**19980004615** Ceramtec, Inc., Salt Lake City, UT USA

**Sensors for Natural Gas Combustion Control Systems Final Report, Oct. 1992 - Jun. 1996**

Li, L. J., Ceramtec, Inc., USA; Nyce, R., Ceramtec, Inc., USA; Joshi, A., Ceramtec, Inc., USA; Jun. 1996; 39p; In English Contract(s)/Grant(s): GRI-5093-293-2202

Report No.(s): PB97-171649; CERAMATEC-9656901; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents the results of an effort to develop a cost-effective, reliable and accurate continuous emission monitoring (CEM) analyzer based on a novel solid-state electrochemical NO(x) sensor. The target applications for this product are large stationary natural gas emission sources such as gas transmission and power generation engines and turbines as well as industrial sites that may be required to have an on-line and continuous monitoring capability.

NTIS

*Gas Detectors; Natural Gas; Combustion Control; Exhaust Gases*

**19980004703** NERAC, Inc., Tolland, CT USA

**Analysis of Solid Surfaces. (Latest citations from the NTIS Bibliographic Database)**

May 1997; In English; Page count unavailable. Supersedes PB96-862602.

Report No.(s): PB97-860316; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning techniques and equipment used in the analysis and characterization of solid surfaces. Spectroscopic, chemical, x-ray, and ion beam techniques are among those discussed. Descriptions and results of specific studies are included.

NTIS

*Bibliographies; Solid Surfaces; Surface Properties; X Ray Analysis; X Rays; Ion Beams; Chemical Analysis*

**19980004720** Joint Inst. for Nuclear Research, Lab. of Nuclear Reactions, Dubna, USSR

**Electrical conductivity of implanted by inert gas silicon layers, stimulated by oxygen impurities *Ehlektricheskaya aktivnost' implantirovannykh ionami inertnykh gazov sloev kremniya, obuslovlennaya primes'yu kisloroda***

Kazyuchits, N. M., Belarussian State Univ., Byelarus; Varichenko, V. S., Belarussian State Univ., Byelarus; Zajtsev, A. M., Belarussian State Univ., Byelarus; Didyk, A. Y., Belarussian State Univ., Byelarus; Skuratov, V. A., Joint Inst. for Nuclear Research,



USSR; Fahrner, W., Gesamthochschule, Germany; 1996; 10p; In Russian  
Report No.(s): JINR-R-14-96-231; DE97-613635; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche

N- and p-kind silicon samples were irradiated by (sup 129)Xe and (sup 84)Kr ions with energies 340 and 210 MeV correspondently in the interval of fluences from 10(exp 11) up to 10(exp 14) ions/cm(sup 2). The local electrical conductivity of silicon layer near the projected range of inert gas ions after the high temperature annealing was discovered. It was established that this layer has n-kind of conductivity and it is connected with high level concentration of technological oxygen impurity. Electrical conductivity of layer is the result of new donor generation in temperature interval 550-800 deg C and is kept at high temperature treatments. The creation of conductive layers at big depth follows to wait after annealing of silicon with oxygen impurities implanted by various heavy ions.

DOE

*Electrical Resistivity; Ion Implantation; Rare Gases; Silicon; Annealing*

**19980004773** Electricite de France, Direction des Etudes et Recherches, Clamart, France

**Sorption and Desorption Kinetics of Some Radionuclides on Suspended Matter Comparison of Different Models** *Biologie, Sciences de la Terre et Protection de l'Environnement*

Ciffroy, P., Electricite de France, France; Garnier, J. M., Electricite de France, France; PhamMai, K., Electricite de France, France; Siclet, F., Electricite de France, France; 1996; 14p; In English

Report No.(s): EDF-96-NV-00042; DE97-624283; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

To obtain suitable data for modelling radionuclides migration in freshwater streams, the sorption kinetics of some radionuclides (Mn-54, Co-58, Cs-134) on suspended matter were studied under controlled laboratory conditions. The experimental results show that for some radionuclides (Co-58, Mn-54), the adsorption process is progressive and slow after 5 days, an important fraction of the radioactivity is associated to the particles. For Cs-134, very fast sorption is followed by much slower and extended uptake the retention of Cs-134, above all of Mn-54 and Co-58, on suspended matter is stronger when the particles have been previously in contact with the radionuclides during a long period. This retention could be due to the slow transfer of Mn-54 and Co-58 to non-exchangeable sites of the particles. This effect of contact time during preliminary adsorption is less important for Cs-134. The results of uptake and release experiments were used to test models describing the radionuclides interactions with suspended solids. Two kinetic models are compared in this paper. The model taking into account two distinct types of sites on the solid phase and irreversible processes better describes the interactions of radionuclides with suspended matter.

DOE

*Sorption; Cobalt 58; Cesium 134; Manganese Isotopes*

**19980004799** Institute of Nuclear Chemistry and Technology, Warsaw, Poland

**Electron paramagnetic resonance of radicals and metal complexes**

1996; 113p; In English; 2nd; International Conference of the Polish EPR Association: Electron Paramagnetic Resonance of Radicals and Metal Complexes, 9-13 Sep. 1996, Warsaw, Poland

Report No.(s): INIS-PL-0002; CONF-9609347; DE97-624158; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The conference of Electron Paramagnetic Resonance of Radicals and Metal Complexes has been held in Warsaw from 9 to 13 September 1996. It was the Second International Conference of the Polish EPR Association. The very extensive group of systems containing paramagnetic species has been studied by means of ESR or other magnetic techniques like ENDOR, Spin Echo etc. by radiation or photochemically generated radicals have been stabilized in low temperatures or being detected by means of very fast pulsed techniques. The chemical reactions, reaction kinetics of radicals as well as spin interaction with matrices have been studied and discussed. Over 100 lectures and posters have been presented.

DOE

*Magnetic Resonance; Conferences; Spin Resonance; Rare Earth Compounds; Radicals; Electron Emission*

**19980004915** National Defence Research Establishment, Dept. of Weapons and Protection, Stockholm, Sweden

**Smoke Spread in a Two-Plane Compartment: An Experimental Study Using Small and Full Scale Tests** *Roekspridning i en Tvaplanskonfiguration: En Experimentell Studie med Smaskaliga och Storskaliga Foersoeek*

Haeggglund, B., National Defence Research Establishment, Sweden; Nireus, K., National Defence Research Establishment, Sweden; Werling, P., National Defence Research Establishment, Sweden; Dec. 1996; 47p; In English

Report No.(s): PB97-173751; FOA-R-96-00348-2.4-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Small and full-scale fire tests were carried out in a two-plane configuration. The fuel was kerosene burnt in square steel pans in the bottom plane. The parameters varied were the fire size, ceiling vent, and the vent opening between the planes. Experimental data given are the smoke-free height, temperature, mass flow, optical density, and the oxygen concentration for the period of approximately steady-state conditions. Small-scale test data are compared with full-scale test data and calculated data by zone and CFD modeling techniques are compared with the measured data from some full-scale tests.

NTIS

*Fires; Ventilation; Smoke; Flow Distribution*

**19980005012** California Univ., Dept. of Mechanical and Aerospace Engineering, Irvine, CA USA

**Energetic Fuel Droplet Gasification with Liquid-Phase Reaction Final Report, 1 Nov. 1993 - 30 Jun. 1997**

Sirignano, William A., California Univ., USA; Schiller, David N., California Univ., USA; Sep. 1997; 31p; In English

Contract(s)/Grant(s): N00014-93-I-0053

Report No.(s): AD-A329877; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An analytical and computational study of the gasification and oxidation of an energetic liquid fuel droplet is presented. Single-step, finite-rate, Arrhenius reaction rate expressions are used for exothermic liquid-phase decomposition and gas-phase oxidation. The liquid fuel is assumed to decompose to a gaseous product at a fixed number of bubble sites per unit mass (specified a priori) within the droplet. Decomposed gas escapes the droplet surface by: (1) decomposition (gasification) of the droplet surface, (2) decomposition at the surface of bubbles that connect with the droplet surface, and (3) escape of gas inside bubbles due to droplet surface regression. Without oxidation, results are compared between one model wherein gaseous fuel leaves the droplet due to decomposition of the droplet surface and bubbles that connect with the droplet surface when the void fraction exceeds a critical value ( $\phi_c$ ), and another model wherein the droplet mass decreases due to discontinuous bubble bursting at the droplet surface. The models agree well (with the exception of oscillations in the droplet radius predicted by the latter model) in the limit of  $\phi_c$  approach. 1. The transient, two-phase, governing equations are solved numerically for various values of the nondimensional reaction rate coefficients (for both decomposition and oxidation), heats of decomposition and oxidation, number of bubbles per unit mass ( $N/m$ ), and ambient temperature and pressure. Consistent with simplified scaling for the limit of chemical rate control, the droplet lifetime  $\tau_d^*$  is strongly dependent on the nondimensional decomposition rate constant and activation energy, and less strongly on the number of bubbles per unit mass, ambient pressure, and heat of decomposition. Increasing the ratio of gas-phase to liquid-phase thermal conductivities increases  $\tau_d^*$  slightly.

DTIC

*Gasification; Liquid Fuels; Oxidation; Reaction Kinetics; Exothermic Reactions*

**19980005102** Lockheed Idaho Technologies Co., Idaho Falls, ID USA

**SIMS analysis: Development and evaluation, 1994**

Groenewold, G. S., Lockheed Idaho Technologies Co., USA; Appelhans, A. D., Lockheed Idaho Technologies Co., USA; Ingram, J. C., Lockheed Idaho Technologies Co., USA; Delmore, J. E., Lockheed Idaho Technologies Co., USA; Dahl, D. A., Lockheed Idaho Technologies Co., USA; Dec. 1994; 92p; In English

Contract(s)/Grant(s): DE-AC07-94ID-13223

Report No.(s): INEL-94/0177; DE97-050828; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Secondary ion mass spectrometry (SIMS) was evaluated for applicability to the characterization of salt cake and environmental samples. Salt cake is representative of waste found in radioactive waste storage tanks located at Hanford and at other DOE sites; it consists of nitrate, nitrite, hydroxide, and ferrocyanide salts, and the samples from the tanks are extremely radioactive. SIMS is an attractive technology for characterizing these samples because it has the capability for producing speciation information with little or no sample preparation, and it generates no additional waste. Experiments demonstrated that substantial speciation information could be readily generated using SIMS: metal clusters which include nitrate, nitrite, hydroxide, carbonate, cyanide, ferrocyanide and ferricyanide were observed. In addition, the mechanism of SIMS desorption of tributyl phosphate (TBP) was clearly identified, and minimum detection limit studies involving TBP were performed. Procurements leading to the construction of an ion trap SIMS instrument were initiated. Technology transfer of SIMS components to three instrument vendors was initiated. For FY-95, the SIMS evaluation program has been redirected toward identification of metal species on environmental samples.

DOE

*Hydroxides; Iron Cyanides; Metal Clusters; Phosphates; Procurement; Radioactive Wastes; Radioactivity; Secondary Ion Mass Spectrometry; Storage Tanks*

**19980005111** Lawrence Livermore National Lab., Livermore, CA USA

**Conversion of Methane to Higher Hydrocarbons: Biomimetic Catalysis of the Conversion of Methane to Methanol Final Report, 1987-1992**

Watkins, B. E., Lawrence Livermore National Lab., USA; Taylor, R. T., Lawrence Livermore National Lab., USA; Satcher, J. H., Lawrence Livermore National Lab., USA; Hanna, M. L., Lawrence Livermore National Lab., USA; Himmelsbach, M. A., Lawrence Livermore National Lab., USA; Sep. 1993; 93p; In English

Report No.(s): PB96-146279; UCRL-CR-119242; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The future for methane conversion and natural gas chemicals processing depends on the development of catalyzed routes for direct methane conversion to liquid hydrocarbons. In addition to inorganic catalysts that react with methane, a select group of aerobic soil/water bacteria (methanotrophs) utilize methane as the sole source of their energy and carbon for cellular growth. The first reaction in this metabolic pathway is catalyzed by the enzyme Methane MonoOxygenase (MMO) forming methanol. In this work, the MMO is used as a biocatalyst, as the initial focus in the development of discrete chemical catalysts (biomimetic complexes) for methane conversion. This approach exploits a biocatalytic system already performing a desired transformation of methane, and generates new information on catalyst structure and function.

NTIS

*Natural Gas; Methane; Catalysts; Hydrocarbons; Technologies*

**19980005116** Utah Univ., Office of Sponsored Projects, Salt Lake City, UT USA

**Spectroscopy and Thermal Decomposition Mechanism of NTO Final Report, 14 Feb. 1994 - 13 Feb. 1997**

Wight, Charles A., Utah Univ., USA; Jul. 1997; 57p; In English

Contract(s)/Grant(s): F49620-94-I-0125; AF Proj. 2303

Report No.(s): AD-A329758; AFOSR-TR-97-040; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The physical and chemical properties of the high explosive NTO have been investigated by infrared spectroscopy and thin film infrared laser pyrolysis in order to determine the initial chemical steps in the decomposition mechanism. It was found that the initial steps form carbon dioxide by a bimolecular reaction mechanism involving reaction of two NTO molecules in the crystal. The relative insensitivity of NTO to accidental ignition is attributed to a unique crystal structure that holds reactive groups of the molecules apart from each other and forces disruption of the crystal structure (melting) before reaction can take place. A similar mechanism has been found to explain the insensitivity of 2,4-dinitroimidazole compared with its structural isomer, 1,4-dinitroimidazole.

DTIC

*Chemical Properties; Crystal Structure; Crystals; Infrared Lasers; Infrared Spectroscopy; Isomers; Pyrolysis; Reactivity; Sensitivity*

**19980005118** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Millimeter and Submillimeter Wavelength Studies of Nitric Acid's nu 6, nu 7 and nu 8**

Williams, Sean, Air Force Inst. of Tech., USA; Sep. 30, 1997; 82p; In English

Report No.(s): AD-A329752; AFIT-97-030; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Millimeter and submillimeter-wave studies have been performed on the HNO<sub>3</sub> molecule by means of a FAsT Scan Submillimeter Spectroscopic Technique (FASST). An ISTOK OB-30 BWO was used to take fast scans of the region 245-370 GHz. Over 500 spectral lines due to rotational transitions have been assigned for the HNO<sub>3</sub> or nitric acid in the nu<sub>6</sub>, nu<sub>7</sub>, and nu<sub>8</sub>, vibrational states. A Watson S- and A- reduced Hamiltonian and non-linear least squares fitting procedures were used in the analysis of the measured HNO<sub>3</sub> lines. The rotational constants and rms deviations for each vibrational mode are reported.

DTIC

*Microwave Oscillators; Millimeter Waves; Nitric Acid; Root-Mean-Square Errors; Spectroscopic Analysis; Submillimeter Waves*

**19980005120** Pennsylvania State Univ., Dept. of Mechanical Engineering, University Park, PA USA

**High Pressure Combustion Studies Under Combustion-Driven Oscillatory Flow Conditions Final Report, 1 Jul. 1994 - 30 Jun. 1997**

Santoro, Robert J., Pennsylvania State Univ., USA; Oct. 03, 1997; 30p; In English

Contract(s)/Grant(s): F49620-94-I-0235; AF Proj. 2308

Report No.(s): AD-A330567; AFOSR-TR-97; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Rocket engines fueled by a dense propellant such as kerosene provide a number of advantages over hydrogen-fueled engines for primary stages. A major problem in the development of liquid fueled rocket engines has been the occurrence of combustion

instability. The lack of a detailed understanding of how combustion instability occurs in liquid-fueled rocket engines has resulted in costly engine development programs that must be avoided in the future. The present research program examined the specific effects of atomization in combustion instability. The effects of mean drop size, drop size distribution, and atomization periodicity were examined explicitly with a combustion response model, the results from which indicated that all of these effects were important. It was shown that periodic atomization, in particular, results in large variations in the magnitude of the response when the atomization frequency is on the same order as the acoustic oscillation frequency. Experimental results from a sub-scale rocket combustor that used electro-mechanically forced atomization to accentuate the natural frequency of periodic atomization associated with impinging jet injectors were also undertaken. The presence of forced longitudinal modes, corresponding to the forced atomization frequencies, substantiate the importance of periodic atomization. A conceptual model of this potentially dominant mechanism of combustion instability was also developed as part of the study.

DTIC

*Combustion Stability; Atomizing; Drop Size; Liquid Propellant Rocket Engines; Oscillating Flow*

**19980005124** Cornell Univ., Ithaca, NY USA

**Modelling Mixing and Reaction in Turbulent Combustion** *Final Report, 15 Feb. 1994 - 14 Feb. 1997*

Pope, S. E., Cornell Univ., USA; Jul. 29, 1997; 144p; In English

Contract(s)/Grant(s): F49620-94-I-0098; AF Proj. 2308

Report No.(s): AD-A329891; AFOSR-TR-97-040; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The overall objective of the research project was to develop, test and demonstrate a combined methodology for modelling turbulent combustion. The method was based on the solution by a particle/Monte Carlo method of a modelled transport equation for the joint probability density function (PDF) of velocity, turbulence frequency, and thermochemical composition. New contributions were made to several aspects of the method. An improved turbulent mixing model (EMST) was developed and demonstrated in turbulent flames. A new model for turbulence frequency, and a wavevector model that is exact for rapid distortions was developed. The PDF methodology was also extended for incorporation in large eddy simulations. Overall, the PDF method was substantially advanced and demonstrated to be an effective approach for calculating the turbulent reactive flows encountered in propulsion devices.

DTIC

*Turbulent Flow; Turbulent Mixing; Large Eddy Simulation; Monte Carlo Method; Probability Theory; Turbulent Combustion*

**19980005146** Stanford Univ., Stanford, CA USA

**GRI-Mech 2.11: An Optimized Detailed Chemical Reaction Mechanism for Methane Combustion and NO Formation and Reburning** *Topical Report, Jun. 1994 - Feb. 1996*

Bowman, C. T., Stanford Univ., USA; Hanson, R. K., Stanford Univ., USA; Gardiner, W. C., Texas Univ., USA; Lissianski, V., Texas Univ., USA; Frenklach, M., California Univ., USA; Goldenberg, M., California Univ., USA; Smith, G. P., SRI International Corp., USA; Mar. 1997; 56p; In English

Report No.(s): PB97-161772; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In the research described in this report, a reaction model for methane combustion and NO formation and reburning was optimized based upon critical review of the thermochemical and rate coefficient information in the literature, sensitivity analysis using computer modeling methods, and mathematically rigorous parameter optimization employing a response-surface parameterization method. The computational study was supported by appropriate shock tube, flow reactor, and flame profiling experiments. The resulting reaction model, consisting of 279 reactions of 49 species, was validated by extensive comparisons with literature.

NTIS

*Methane; Nitric Oxide; Chemical Reactions; Reaction Kinetics; Combustion Products*

**19980005217** NERAC, Inc., Tolland, CT USA

**Chromatography for Pollution and Toxicological Analysis. (Latest citations from the Ei Compendex\*Plus Database)**

May 1997; In English; Page count unavailable. Supersedes PB96-862024.

Report No.(s): PB97-860183; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of chromatography in the analysis of air and water pollutants, wastes, and toxic materials. Gas chromatography and high performance liquid chromatography are emphasized in this bibliography. Applications and performance evaluations of chromatographic adsorption processes are included.

NTIS

*Bibliographies; Toxicology; Water Pollution; Air Pollution*



**19980005230** Centre National de la Recherche Scientifique, Toulouse, France

**Phosphorus Containing Dendrimers: Surface Chemistry and Applications Final Report**

Majoral, Jean-Pierre, European Research Office (US Army), UK; Caminade, A. M., European Research Office (US Army), UK; Prevote, D., European Research Office (US Army), UK; Aug. 1997; 52p

Contract(s)/Grant(s): N68171-96-C-9026

Report No.(s): AD-A329172; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The synthesis of phosphorus containing dendrimers is described up to the fifth generation (96 terminal groups). The surface chemistry of these dendrimers allows the grafting of various functionalities such as phosphate (6 O-P(O)(OEt)<sub>2</sub> groups), amino-phosphate (up to 96 N-P(O)(OEt)<sub>2</sub> groups), aminophosphite (up to 96 N-P(OEt)<sub>2</sub> groups), functionalized phosphonate (up to 96 HC(OH)P(O)(OR)<sub>2</sub> (R = Et, (CH<sub>2</sub>)<sub>11</sub>CH<sub>3</sub>), up to 96 HC(N-Pr)P(O)(OEt)<sub>2</sub>, or up to 48 CH=CH-P(O)(OEt)<sub>2</sub>), phosphorus ylide (6 C(O)CH=P(Ph)<sub>3</sub>), carboxylic acid (up to 24 CH=CH-C(O)OH), and tetraazamacrocyclic (up to 12 cyclam). The surface functionalities have been chosen due to the well known properties of the corresponding monomers and/or polymers in various areas such as adhesives, flame retardants, fuel additives, sequestering agents.

DTIC

*Carboxylic Acids; Flame Retardants; Phosphates; Phosphorus; Surface Reactions*

**19980005245** Purdue Univ., School of Mechanical Engineering, West Lafayette, IN USA

**Study of Two Phase High Liquid Loading Jet Fires, 1 Sep. 1993 - 30 Aug. 1994**

Wade, R., Purdue Univ., USA; Sivathanu, Y. R., Purdue Univ., USA; Gore, J. P., Purdue Univ., USA; Oct. 1995; 52p; In English Report No.(s): PB97-196356; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

High liquid loading spray jet fires occur in accidents involving fuel pipe leaks, tank ruptures and oil well blowouts. Laboratory simulations of such fires in the 10-30 kW range has recently become feasible using a novel effervescent atomizer burner. Measurements of flame length, radiative heat loss fractions, evaporation length, path integrated temperatures, and path integrated and local soot volume fractions in high liquid loading jet fires using this burner are reported. The data show that changes in evaporation length do not affect the flame length for the present operating conditions. The flame lengths increase with increasing heat release rate in an overall power law manner.

NTIS

*Atomizers; Blowouts; Burners; Evaporation; Fuel Tanks; Heat Transfer; Pipes (Tubes); Radiant Cooling; Radiative Heat Transfer*

**19980005261** NERAC, Inc., Tolland, CT USA

**Chemical Mechanical Polishing (CMP). (Latest citations from the INSPEC Database)**

Feb. 1997; In English; Page count unavailable. Supersedes PB96-850169

Report No.(s): PB97-856041; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning chemical mechanical polishing and its use with semiconductor devices and various dielectric thin films. Techniques and methods of chemical mechanical polishing and planarization are described for silicon, gallium, aluminum, boron, and copper compounds. Epitaxial layering, metallization, etching, and surface topography are considered.

NTIS

*Boron Compounds; Copper Compounds; Data Bases; Dielectrics; Epitaxy; Etching; Polishing; Semiconductor Devices; Topography*

**19980005275** Acurex Environmental Corp., Research Triangle Park, NC USA

**Mercury Control by Injection of Activated Carbon and Calcium-Based Sorbents**

Krishnan, S. V., Acurex Environmental Corp., USA; Gullett, B. K., Acurex Environmental Corp., USA; Jozewica, W., Acurex Environmental Corp., USA; 1997; 50p; In English

Report No.(s): PB97-193783; EPA/600/A-97/011; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper compares the capture of both elemental mercury (Hg<sup>deg</sup>) and mercuric chloride (HgCl<sub>2</sub>) vapor by different types of commercially available activated carbons and calcium (Ca)-based sorbents, including quicklime (CaO) and hydrated lime, Ca(OH)<sub>2</sub>. Comparisons were made at two temperatures in bench-scale reactors, with other conditions remaining identical. Study results showed that, at the lower temperature (about 100 C), Ca-based sorbents capture incoming HgCl<sub>2</sub> as well as activated carbons. At the higher temperature (140 C), activated carbons showed relatively higher capture of HgCl<sub>2</sub> than Ca-based sorbents. However, only activated carbons exhibited significant capture of Hg<sup>deg</sup> at either temperature. Because field measurements and



equilibrium predictions show that Hg in MWC flue gas exists primarily as HgCl<sub>2</sub>, the results indicate the possibility of injecting CaO or Ca(OH)<sub>2</sub> along with activated carbons to reduce operating costs.

NTIS

*Mercury (Metal); Pollution Control; Sorbents; Activated Carbon; Calcium Oxides; Air Pollution*

**19980005331** Joint Inst. for Nuclear Research, Dubna, USSR

**Measurement of the spin and temperature dependence of the d(mu)-molecule formation rate in solid and liquid deuterium**

Demin, D. L., Joint Inst. for Nuclear Research, USSR; Drebusko, A. E., Joint Inst. for Nuclear Research, USSR; Dzhelepov, V. P., Joint Inst. for Nuclear Research, USSR; 1996; 15p; In English

Report No.(s): JINR-E-15-96-207; DE97-616483; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

Dd(mu) molecule formation rates have been measured from the two hyperfine states of the d(mu)-atom in the temperature range of T=5-30 K. Results are consistent with the measurement of the TRIUMF group at T=3 K and contradict theoretical predictions. The work was performed on the JINR phasotron (Dubna).

DOE

*Temperature Dependence; Deuterium; Solidified Gases; Cyclotrons*

**19980005348** New Mexico Univ., Albuquerque, NM USA

**Relativistic atomic beam spectroscopy II**

[1991]; 59p; In English

Contract(s)/Grant(s): DE-FG04-87ER-13746

Report No.(s): DOE/ER/13746-T3; DE97-003019; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We are requesting support for a postdoctoral person to participate in H(-) studies at Los Alamos. In addition, we are requesting funding for a state-of-the-art YAG laser system that would allow us to obtain data at three times our present rate with improved beam quality.

DOE

*Atomic Beams; Spectroscopy; YAG Lasers; Superconducting Super Collider*

**19980005392** Nijmegen Univ., Dept. of Molecular and Laser Physics, Netherlands

**Twenty-Second International Symposium on Free Radicals**

Sep. 1993; 117p; In English; 22nd; Twenty-Second International Symposium on Free Radicals, 6-10 Sep. 1993, Doorwerth, Netherlands

Contract(s)/Grant(s): F61708-93-W-0819

Report No.(s): AD-A324447; EOARD-CSP-93-1037; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche; Abstracts Only; Abstracts Only

Topics considered include: Photofragment spectroscopy of free radicals; Photodissociation dynamics of free radicals; Rotation vibration state specific studies of the unimolecular dynamics of highly vibrationally excited molecules; High resolution spectroscopy of fragments from photodissociation; Free radicals in interstellar space; Microwave spectra and structure of HC<sub>3</sub>O; Rotational energy transfer of OH in collisions with He, Ar and H<sub>2</sub>; Rotationally and electronically inelastic scattering of diatomic free radicals; Bridged structures in small molecules and ions from their millimeter waves spectrum; Fourier-transform microwave spectroscopy of free radicals and radical complexes; Potential energy surfaces from the spectroscopy of open-shell and closed-shell van der Waals complexes; and laser induced fluorescence spectroscopy of complexes containing free radicals.

DTIC

*Free Radicals; Abstracts; Conferences*

**19980005711** NERAC, Inc., Tolland, CT USA

**Oil-Water Separators (Latest citations from the Ei Compendex\*Plus Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870431; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, and evaluation of oil-water separators used in the marine, industrial manufacture, and petrochemical industries. Gravity separators, coalescers, filters, and flotation systems are discussed. Oil spill cleanup operations and systems are included.

NTIS

*Bibliographies; Separators; Water; Oils; Design Analysis; Fabrication; Evaluation*

**19980005851** Atomic Energy of Canada Ltd., Whiteshell Labs., Pinawa, Manitoba Canada

**Solubility and Dissolution Rate Measurements for TcO<sub>2</sub>(cr) in the Absence and Presence of CO<sub>3</sub>(2-)(aq): Preliminary Data**

Burnett, K. B., Atomic Energy of Canada Ltd., Canada; Jobe, D. J., Atomic Energy of Canada Ltd., Canada; Mar. 1997; 15p; In English

Report No.(s): PB97-154074; COG-95-387-I; TR-702; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have initiated experiments to measure the solubility of technetium dioxide(cr) as a function of pH in both the absence and presence of carbonate(aq). After 100 days, only two solutions appear to have achieved equilibrium; therefore, we present a preliminary analysis of the current data. These data indicate measurements of the solubility of technetium dioxide(cr) are possible even though Tc(IV) is easily oxidized to the much more soluble Tc(VII) state. Analysis also indicates that the dissolution rate near neutral pH is quite slow and the solubility is very low, less than  $3 \times 10^{-8}$  mol-dm<sup>-3</sup>. Also, the presence of fine particles can complicate the analysis of the dissolution data. These particles dissolve rapidly resulting in non-Nernstian solubility behavior and sometimes form metastable, supersaturated solutions.

NTIS

*Technetium; Solubility; Dissolving; Dioxides; pH*

**19980005863** NERAC, Inc., Tolland, CT USA

**Catalytic Recombination of Hydrogen and Oxygen (Latest citations from the Energy Science and Technology Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870407; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the catalytic supported recombination of hydrogen and oxygen. References to the development and evaluation of recombination technology for use in waste gas removal from electrochemical cells, nuclear reactor safety systems, thermochemical processes, and exhaust gas treatment are presented. Topics include types of catalysts, catalytic kinetics, lead-acid batteries, hydroxyl radicals, hydrogen isotope recombination, and radioactive waste storage.

NTIS

*Bibliographies; Recombination Reactions; Chemical Reactions; Electric Batteries; Fuel Cells; Catalysts; Technologies; Radioactive Wastes*

**19980006075** Old Dominion Univ., Dept. of Aerospace Engineering, Norfolk, VA USA

**Enhanced Glow Discharge Production of Oxygen Final Report, Period ending 31 Dec. 1997**

Ash, Robert, Old Dominion Univ., USA; Zhong, Shi, Old Dominion Univ., USA; Jan. 1998; 5p; In English

Contract(s)/Grant(s): NAG1-1140

Report No.(s): NASA/CR-1998-206653; NAS 1.26:206653; ODURF-104555; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Studies starting in late seventies have shown Mars atmosphere can be used as a feedstock for oxygen production using simple chemical processing systems during early phases of the Mars exploration program. This approach has been recognized as one of the most important in-situ resource utilization (ISRU) concepts for enabling future round trip Mars missions. It was determined a decade ago that separation of oxygen can be accomplished efficiently by permeation through a silver membrane at temperatures well below 1000 K. This process involves adsorption of atomic oxygen on the surface and its subsequent diffusion through a silver lattice via an oxygen concentration gradient. We have determined recently that glow discharge can be used to liberate atomic oxygen from Mars atmosphere and that the oxygen can be collected through a silver permeation membrane. Recently, we demonstrated a substantial increase in energy efficiency of the process by applying a radio frequency discharge in combination with a silver permeation membrane. The experiments were performed using pure carbon dioxide in the pressure range equal to Mars surface conditions. Energy efficiency was defined as the ratio of the energy required to dissociate a unit mass of oxygen from carbon dioxide to the (electrical) energy consumed by the overall system during the dissociation and collection process. The research effort, started at NASA Langley Research Center, continued with this project. Oxygen production apparatus, built and

operated under the research grant NAG1-1140 was relocated to the Atomic Beams Laboratory at ODU in July 1996, being since then in full operation.

Derived from text

*Mars Atmosphere; Oxygen Production; Mars Surface; Chemical Composition; Mars Exploration; Adsorption; Oxygen Atoms; Silver; Glow Discharges*

**19980006130** Princeton Univ., Dept. of Material and Aerospace Engineering, NJ USA

**Ignition and Flame Stabilization in High Speed Flows Final Report, 1 Sep. 1994 - 31 Aug. 1997**

Law, Chung K., Princeton Univ., USA; Aug. 31, 1997; 46p; In English

Contract(s)/Grant(s): F49620-94-I-0391; AF Proj. 3484

Report No.(s): AD-A329852; AFOSR-TR-97-0404; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Reduced mechanisms for ignition of hydrogen by heated air were deduced for the high-temperature/low-pressure and the low-temperature/high-pressure regimes. The reduced mechanisms were subsequently applied to the physical situations of the supersonic mixing layer and the counterflow through numerical simulation and activation energy asymptotics. Various ignition criteria were derived, and the issues of thermal versus radical induced ignition, external versus internal heating in inducing ignition, and quasi-steady versus transient ignition, were explored.

DTIC

*Counterflow; Mixing Layers (Fluids); Radicals; Activation Energy; Hydrogen; Ignition*

**19980006133** Army Research Lab., Aberdeen Proving Ground, MD USA

**Optical Measurements of Toxic Gases Produced during Firefighting Using Halons**

Mcnesby, K. L., Army Research Lab., USA; Daniel, R. G., Army Research Lab., USA; Miziolek, A. W., Army Research Lab., USA; Modiano, S. H., Army Research Lab., USA; Apr. 1997; 48p; In English

Report No.(s): PB97-169098; ARL-TR-1349; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Several optical techniques Fourier transform infrared (FT-IR) emission and absorption spectroscopy, mid- and near-infrared tunable diode laser (MIR-TDL, NIR-TDL) absorption spectroscopy have been used to measure toxic gases produced during inhibition of flames by halogenated hydrocarbons (Halon). Fire types studied include low-pressure premixed flames, atmospheric-pressure counterflow diffusion flames, open-air JP-8 (turbine fuel) fires, and confined JP-8 fires. Spectra are presented and analyzed for these fires inhibited by CF3Br (Halon 1301) and C3F7H (FM-200). For real-scale fire testing, it is shown that type and amount of toxic gases produced during fire inhibition are highly dependent on fire conditions and temperatures, and that some species not considered important (CF2O) are often produced in significant amounts.

NTIS

*Gases; Toxicity; Optical Measurement; Fire Fighting; Combustion Physics; Toxic Diseases*

**19980006137** NERAC, Inc., Tolland, CT USA

**Attenuated Total Reflectance Infrared Spectroscopy (Latest citations from the INSPEC Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870894; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the research and development of attenuated total reflection (ATR) infrared spectroscopy technology used in materials analysis and evaluation. Fourier transform ATR infrared spectroscopy and microspectroscopy are discussed. References cover the study of surface properties and structures of polymers, semiconductors, insulators, magnetic materials, films, and crystals. Also discussed are polymer-metal interfaces, surface cleaning and annealing, membrane protein, and infrared intensity standards. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Infrared Spectroscopy; Spectroscopic Analysis; Reflectance*

**19980006269** Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA

**A Ballistic Compressor-Based Setup for the Visualization of Liquid Propellant Jet Combustion Above 100 MPa Final Report, Oct. 1995 - Sep. 1996**

Birk, Avi, Army Research Lab., USA; Kooker, Douglas E., Army Research Lab., USA; Sep. 1997; 44p; In English

Contract(s)/Grant(s): DA Proj. 1L1-622618-AH-37

Report No.(s): AD-A329856; ARL-TR-1490; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the components and operation of an experimental setup for the visualization of liquid propellant (LP) jet combustion at pressures above 100 MPa. The apparatus consists of an in-line ballistic compressor and LP injector. The ballistic compressor, based on a modified 76-mm gun, provides high pressure (55 MPa) clear hot gas for the jet ignition. A piston (projectile) is fired toward a test chamber beyond the barrel's end, and its rebound is arrested in a transition section between the test chamber and the barrel. The LP jet is injected once the piston is restrained, and combustion of the jet further elevates the pressure. At a preset pressure, a disk in the piston ruptures, and the combustion gas vents sonically into the barrel. If a monopropellant is used, the jet injection combustion process then resembles liquid rocket combustion, but at very high pressures (140 MPa). This report discusses the ballistics of the compression and compares experimental results to those predicted by a numerical model of the apparatus. Experimentally, a pressure of 70 MPa was achieved upon a 12.5 volumetric compression factor or by firing a 10-kg piston into 1.04 MPa argon, using a charge of 75g of small grain M1 propellant.

DTIC

*Argon; Ballistics; Combustion; Compressors; Gas Jets; High Pressure; High Temperature Gases; Injectors; Liquid Rocket Propellants; Mathematical Models*

## 26

### METALLIC MATERIALS

*Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.*

**19980003962** NERAC, Inc., Tolland, CT USA

**Gold Coatings and Plating Processes. (Latest citations from the NTIS Bibliographic Database)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-857040.

Report No.(s): PB97-851844; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning gold coating and plating processes and equipment. Gold-coated glasses, ceramics, plastics, leads, washers, and tips are reviewed. Applications in electronics, optics, aerospace, architecture, electrical components, and jewelry are presented.

NTIS

*Bibliographies; Gold Coatings; Plating; Technologies*

**19980003964** Swedish Inst. for Metals Research, Stockholm, Sweden

**Precipitation Phenomena in V-Microalloyed 0.15-0.22 % C Structural Steels**

Zajac, S., Swedish Inst. for Metals Research, Sweden; Siwecki, T., Swedish Inst. for Metals Research, Sweden; Hutchinson, B., Swedish Inst. for Metals Research, Sweden; Dec. 1996; 50p; In English

Report No.(s): PB97-209167; IM-3453; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The role of nitrogen and carbon in vanadium microalloyed structural steels is discussed in the present paper which analyses quantitatively the theoretical basis for achieving maximum precipitation strengthening with a minimum of V addition. The effect of nitrogen, in particular, has been studied with regard to precipitation of the V(C,N) in proeutectoid ferrite and pearlite during isothermal and continuous transformation. The influence of various compositional and process parameters on the microstructure and yield strength have been determined. The precipitation strengthening contribution to the yield strength from V(C,N) has been evaluated and compared with Orowan theory.

NTIS

*Vanadium; Additives; Carbon; Nitrogen; Pearlite; Ferrites; Microstructure; Construction Materials; Steels*

**19980003981** Swedish Inst. for Metals Research, Stockholm, Sweden

**Notch Sensitivity of Austenitic and Duplex Stainless Sheet Steels**

Linder, J., Swedish Inst. for Metals Research, Sweden; Larsson, M., Swedish Inst. for Metals Research, Sweden; 1997; 26p; In English

Report No.(s): PB97-209209; IM-3491; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Fatigue notch sensitivity has been investigated for a duplex stainless steel (SAF2304), and for one austenitic stainless steel (SS2333) in annealed and in prestrained condition. Specimens with three different elastic stress concentration factors between 1.02 to 2.23 have been tested. Fatigue strength for notched specimens have at the most been found to be 20% lower than fatigue strength for unnotched specimens. Fatigue strength improvement due to prestraining of austenitic stainless steel is shown for small

elastic stress concentration factors. However, as elastic stress concentration increases, the positive effect of fatigue strength is reduced due to larger notch sensitivity for prestrained material.

NTIS

*Stainless Steels; Notch Sensitivity; Metal Sheets*

**19980003984** NERAC, Inc., Tolland, CT USA

**Lightweight Alloys: Latest citations from METADEX**

Aug. 1996; In English; Page Count Unavailable

Report No.(s): PB96-872759; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development and application of lightweight alloys. The lightweight alloys are based on steel, aluminum, titanium, zinc, and magnesium. Applications include lightweight building construction materials, castings, rail and road vehicles, shipbuilding, aircraft structures, and portable tools, such as welders. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Titanium Alloys; Aluminum Alloys; Magnesium Alloys; Zinc Alloys*

**19980004012** Bettis Atomic Power Lab., West Mifflin, PA USA

**Evaluation of Oxide Dispersion Strengthened (ODS) molybdenum alloys**

Bianco, R., Bettis Atomic Power Lab., USA; Buckman, R.W., Jr., Bettis Atomic Power Lab., USA; 1995; 42p; In English; ASM/TMS Symposium on High-temperature Materials, 18-19 May 1995, Schenectady, NY, USA

Contract(s)/Grant(s): DE-AC11-93PN-38195

Report No.(s): WAPD-T-3073; CONF-9505389-1; DE97-002427; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A series of fourteen (14) novel high-strength molybdenum alloy compositions containing a dispersion of very fine (less than 1 (mu)m diameter) oxide particles were consolidated using two proprietary powder metallurgy techniques. The developmental compositions were evaluated to determine the microstructural stability and mechanical properties from cryogenic (-148(degrees)F) to elevated temperatures (4000(degrees)F) for material in the as-swaged (greater than 98% cold work) condition and for as-swaged material in the heat treated condition. Extremely fine oxide particle sizes (less than 1000 (Angstrom)) were observed by Transmission Electron Microscopy (TEM) for a number of the experimental compositions in the as-swaged condition. A one hour recrystallization temperature as high as 3990(degrees)F was measured and a ductile-to-brittle transition temperature as low as (approximately)58(degrees)F for material in the recrystallized condition was determined. The preliminary results support the alloy design concept feasibility.

DOE

*Molybdenum Alloys; Mechanical Properties; Chemical Composition; Lanthanum Alloys; Yttrium Alloys; Transition Points; Powder Metallurgy; High Strength Alloys; Recrystallization; Brittleness*

**19980004024** Institute of Atomic Energy, Otwock-Swierk, Poland

**Effects of inhomogeneity of radiation damage through the specimen thickness after heavy ion irradiation on yield strength of zirconium** *Wpływ niejednorodności rozkładu uszkodzeń radiacyjnych na grubości próbki po napromienieniu ciężkimi jonami na granice plastyczności cyrkonu*

Hofman, A., Institute of Atomic Energy, Poland; Kochanski, T., Institute of Atomic Energy, Poland; Malczyk, A., Institute of Atomic Energy, Poland; Didyk, A. Y., Joint Inst. for Nuclear Research, USSR; Skuratov, V. A., Joint Inst. for Nuclear Research, USSR; 1995; ISSN 1232-5317; 11p; In Polish

Report No.(s): IAE-11/A; DE97-616900; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The tensile specimens prepared from high purity zirconium foils of 22 (mu)m thickness were irradiated by Ar ions (E=460 MeV) and by Ne ions (E=230 MeV). The irradiations were carried out on the external beam of the U-400 cyclotron in JINR (the Joint Institute for Nuclear Research, Dubna). The inhomogeneity effects of irradiation damages through the specimen thickness after irradiation by ions on the yield strength was investigated. The results of radiation hardening of zirconium after irradiation by Ne and Ar ion are described.

DOE

*Irradiation; Mechanical Properties; Microstructure; Zirconium; Radiation Effects; Ion Irradiation*



**19980004029** Los Alamos National Lab., NM USA

**Development of recrystallization texture and microstructure in cold rolled copper**

Necker, C. T., Los Alamos National Lab., USA; Doherty, R. D., Drexel Univ., USA; Rollett, A. D., Carnegie-Mellon Univ., USA; 1996; 9p; In English; REX 1996: International Conference on Recrystallization and Related Phenomena, 21-24 Oct. 1996, Monterey, CA, USA

Contract(s)/Grant(s): W-7405-eng-36

Report No.(s): LA-UR-96-4482; CONF-9610242-4; DE97-003143; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Oxygen free electronic copper, 99.995% purity, of two initial grain sizes, 50 ( $\mu$ m) and 100 ( $\mu$ m), has been cold rolled to six strains of 1.0, 1.5, 2.0, 2.65, 3.5 and 4.5 (von Mises equivalents). The rolled materials were partially and fully recrystallized to study the development of recrystallization textures as a function of grain size, strain and fraction recrystallized. The initial textures were relatively random and the deformation textures show the classic (beta) fiber development. As strain is increased both materials produce increasingly intense cube recrystallization textures, (100) <001, as measured both by x-ray diffraction and the electron backscatter pattern (EBSP) techniques. The strong cube recrystallization textures are a product of a higher than random frequency of cube nucleation sites. An additional factor is that cube regions grow larger than non-cube regions. The explanation of the cube frequency advantage is based on the development of large stored energy differences between cube orientations and neighboring orientations due to recovery of cube sites. Of several possible explanations of the cube orientation size advantage, the most plausible one is solute entrapment. At the higher strains the boundaries of cube grains encounter the deformation texture S components, (123) <634, changing the boundary character to one of 40(degrees) <111. These boundaries are more resistant to solute accumulation than random high angle boundaries, allowing the boundaries to migrate with less of a solute drag effect than a random high angle boundary.

DOE

*X Ray Diffraction; Microstructure; Recrystallization; Deformation; Copper*

**19980004031** Oak Ridge National Lab., TN USA

**Irradiation creep at temperatures of 400 (degrees)C and below for application to near-term fusion devices**

Grossbeck, M. L., Oak Ridge National Lab., USA; Gibson, L. T., Oak Ridge National Lab., USA; Mansur, L. K., Oak Ridge National Lab., USA; 1996; 32p; In English; 18th; Symposium on Effects of Radiation on Materials, 25-27 Jun. 1996, Hyannis, MA, USA

Contract(s)/Grant(s): DE-AC05-96OR-22464

Report No.(s): CONF-960643-3; DE97-002632; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

To study irradiation creep at 400(degrees)C and below, a series of six austenitic stainless steels and two ferritic alloys was irradiated sequentially in two research reactors where the neutron spectrum was tailored to produce a He production rate typical of a fusion device. Irradiation began in the Oak Ridge Research Reactor; and, after an atomic displacement level of 7.4 dpa, the specimens were moved to the High Flux Isotope Reactor for the remainder of the 19 dpa accumulated. Irradiation temperatures of 60, 200, 330, and 400(degrees)C were studied with internally pressurized tubes of type 316 stainless steel, PCA, HT 9, and a series of four laboratory heats of: Fe-13.5Cr-15Ni, Fe-13.5Cr-35Ni, Fe-1 3.5Cr-1 W-0.18Ti, and Fe-16Cr. At 330(degrees)C, irradiation creep was shown to be linear in fluence and stress. There was little or no effect of cold-work on creep under these conditions at all temperatures investigated. The HT9 demonstrated a large deviation from linearity at high stress levels, and a minimum in irradiation creep with increasing stress was observed in the Fe-Cr-Ni ternary alloys.

DOE

*Austenitic Stainless Steels; Creep Properties; High Flux Isotope Reactors; Ternary Alloys; Stainless Steels*

**19980004038** Swedish Inst. for Metals Research, Stockholm, Sweden

**Investigation of Sintered Steels Containing Fe-Mn-Si Master Alloy**

Zhang, Z., Northeast Univ. of Technology, China; Salwen, A., Swedish Inst. for Metals Research, Sweden; Jun. 1997; 38p; In English

Report No.(s): PB97-209217; IM-3495; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Iron Fe-Mn-Si master alloy can significantly improve the properties of Astaloy 85Mo and prealloyed Fe-1.5%Cr-0.25Mo base sintered steels. SM35 and SM45 master alloy powders show different sintering behaviors in Astaloy 85Mo sintered steel due to their different melting points. SM45 master alloy sintered steel exhibits shrinkage and a homogeneous microstructure, while SM35 master alloy sintered steel swells. A faster densification and a better homogeneity were obtained in the SM45 sintered steel compared to the SM35 sintered steel. Copper is a good strengthening element both in cast and sintered steels. Although the liquid

phase of copper results in an undesirable expansion at the melting point, it also improves the properties of the Fe-Mn-Si master alloy sintered steel. Tensile strength can increase 90 MPa when the copper content increases with 1%. Better tensile and yield strengths and hardness were obtained in the prealloyed Fe-1.5%Cr-0.25Mo base sintered steel, and similar dimensional changes were observed in both sintered steels. However, prealloyed Fe-1.5%Cr-0.25%Mo base sintered steel shows a lower elongation than Astaloy 85Mo, especially at high alloy content.

NTIS

*Powder Metallurgy; Sintering; Iron Alloys; Additives; Cast Alloys*

**19980004097** Rosenblatt (M.) and Son, Inc., New York, NY USA

**Commercial Ship Design and Fabrication for Corrosion Control Final Report**

Parente, J., Rosenblatt (M.) and Son, Inc., USA; Daidola, J., Rosenblatt (M.) and Son, Inc., USA; Basar, N. S., Rosenblatt (M.) and Son, Inc., USA; Rodi, R. C., Rosenblatt (M.) and Son, Inc., USA; Sep. 24, 1997; 112p; In English

Contract(s)/Grant(s): N00024-87-D-4502

Report No.(s): PB97-141576; SSC-397; SR-1377; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Methods and procedures to accomplish control of corrosion during the design phase as well as during construction and in-service phases of a ship's life are investigated in this study. First part of the report concerns corrosion control practices currently being used by the shipbuilding community during design and fabrication phases. The next part is devoted to detailed design recommendations for corrosion prevention methodologies to reduce life-cycle costs, and their practicality and applicability. In addition to the results of the comprehensive literature search, the responses received from the industry in answer to a questionnaire, specifically prepared for this purpose, are compiled into a set of recommendations for corrosion control. A draft guide is presented which incorporates the results obtained from investigations and industry comments for possible use as the basis for an ASTM Standard.

NTIS

*Corrosion Prevention; Ships*

**19980004130** NERAC, Inc., Tolland, CT USA

**Bacterial Metal Leaching and Bioaccumulation: Latest citations from the Life Sciences Collection Database**

Jun. 1996; In English; Page count unavailable, Supersedes PB95-867271.

Report No.(s): PB96-871215; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning bioleaching and bioaccumulation in metal recovery systems. References study bacterial oxidation, fungal metabolism, metal extraction, and metal recovery from deposits. Gold and uranium ore treatments are discussed. Toxicity characteristic leaching procedure (TCLP) tests and ultrasound pretreatment are examined.

NTIS

*Bibliographies; Extraction; Bacteria; Life Sciences; Toxicity; Uranium; Gold; Leaching*

**19980004559** NERAC, Inc., Tolland, CT USA

**Corrosion Resistance of Nickel and Nickel Alloys. (Latest Citations from Information Services in Mechanical Engineering Database)**

Jan. 1997; In English; Page count unavailable. Supersedes PB86-859368

Report No.(s): PB97-854590; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the corrosion resistance of nickel and nickel alloys used in electrical and structural materials and chemical processes. Topics include susceptibility of nickel to high temperature sulfidation, normal exposure to saline and other high chloride environments, pitting corrosion, and metal coatings. Special cases of corrosion of weld-filler metal combinations are also included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Corrosion Resistance; Nickel; Nickel Alloys*

**19980004574** Argonne National Lab., Materials Science Div., IL USA

**Transmission electron microscopy study in-situ of radiation-induced defects in copper at elevated temperatures**

Daulton, T. L., Argonne National Lab., USA; Kirk, M. A., Argonne National Lab., USA; Rehn, L. E., Argonne National Lab., USA; Dec. 1996; 8p; In English; Fall Meeting of the Materials Research Society, 2-6 Dec. 1996, Boston, MA, USA

Contract(s)/Grant(s): W-31109-eng-38

Report No.(s): ANL/MSD/CP-90423; CONF-961202-54; DE97-001983; No Copyright; Avail: Issuing Activity (Natl Technical

Information Service (NTIS)), Microfiche

Neutrons and high-energy ions incident upon a solid can initiate a displacement collision cascade of lattice atoms resulting in localized regions within the solid containing a high concentration of interstitial and vacancy point defects. These point defects can collapse into various types of dislocation loops and stacking fault tetrahedra (SFT) large enough that their lattice strain fields are visible under diffraction-contrast imaging using a Transmission Electron Microscope (TEM). The basic mechanisms driving the collapse of point defects produced in collision cascades is investigated in situ with TEM for fcc-Cu irradiated with heavy (100 keV Kr) ions at elevated temperature. The isothermal stability of these clusters is also examined in situ. Areal defect yields were observed to decrease abruptly for temperatures greater than 300 C. This decrease in defect yield is attributed to a proportional decrease in the probability of collapse of point defects into clusters. The evolution of the defect density under isothermal conditions appears to be influenced by three different rate processes active in the decline of the total defect density. These rate constants can be attributed to differences in the stability of various types of defect clusters and to different loss mechanisms. Based upon observed stabilities, estimations for the average binding enthalpies of vacancies to SFT are calculated for copper.

DOE

*Clusters; Collapse; Collisions; Constants; Copper; Crystal Defects; Defects; Diffraction; Displacement; Enthalpy; Estimates; High Temperature; Interstitials; Irradiation*

**19980004585** Los Alamos National Lab., NM USA

**Directed light fabrication of rhenium components**

Milewski, J. O., Los Alamos National Lab., USA; Thoma, D. J., Los Alamos National Lab., USA; Lewis, G. K., Los Alamos National Lab., USA; 1997; 9p; In English; 126th; Minerals, Metals and Materials Society, 9-13 Feb. 1997, Orlando, FL, USA Contract(s)/Grant(s): W-7405-eng-36

Report No.(s): LA-UR-96-4484; CONF-970201-12; DE97-003144; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Directed Light Fabrication (DLF) is a direct metal deposition process that fuses powder, delivered by gas into the focal zone of a high powered laser beam to form fully dense near-net shaped components. This is accomplished in one step without the use of molds, dies, forming, pressing, sintering or forging equipment. DLF is performed in a high purity inert environment free from the contaminants associated with conventional processing such as oxide and carbon pickup, lubricants, binding agents, cooling or cleaning agents. Applications using rhenium have historically been limited in part by its workability and cost. This study demonstrates the ability to fuse rhenium metal powder, using a DLF machine, into free standing rods and describes the associated parameter study. Microstructural comparisons between DLF deposited rhenium and commercial rhenium sheet product is performed. This research combined with existing DLF technology demonstrates the feasibility of forming complex rhenium, metal shapes directly from powder.

DOE

*Costs; Dies; Fabrication; Forging; Laser Beams; Lubricants; Metal Powder; Metallizing; Microstructure; Oxides; Powder (Particles); Purity*

**19980004625** Technische Univ., Dept. of Mathematics and Computing Science, Eindhoven, Netherlands

**Mathematical Modelling and Numerical Simulation of Viscous Sintering Processes**

Mattheij, R. M. M., Technische Univ., Netherlands; vandeVorst, G. A. L., Technische Univ., Netherlands; Oct. 1995; 31p; In English; Figures in this document may not be legible in microfiche

Report No.(s): PB96-206909; RANA-95-14; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The objective of this research is to develop reliable numerical methods to predict the deformation of an incompressible Newtonian viscous fluid region (Stokes Flow) driven by surface tension. In particular, this mathematical model describes the physical processes that appear when a compact of glassy particles is heated to such a high temperature that the glass becomes a viscous creeping fluid. From the methods developed, theoretical insights can be obtained about the densification kinetics of such a compact. Therefore, a numerical simulation program is developed which calculates the deformation of a representative two-dimensional or an axisymmetric unit cell of the compact. A Boundary Element Method is applied to solve the integral equations arising from the Stokes problem and the time integration is carried out by a variable step, variable order Backward Differences Formulae method.

NTIS

*Glass; Sintering; Viscous Fluids; Stokes Flow; Mathematical Models; Numerical Analysis*

**19980004628** California Univ., Dept. of Materials Science and Engineering, Los Angeles, CA USA

**Evaluation of the Effect of Microalloying on Cleavage of Monocrystalline NiAl Using a Miniaturized Disk-Bend Test *Final Report, 1 Mar. 1992 - 6 Mar. 1996***

Ardell, Alan J., California Univ., USA; Aug. 1997; 4p; In English

Contract(s)/Grant(s): NAG3-1325

Report No.(s): NASA/CR-97-113232; NAS 1.26:113232; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

It was originally proposed to investigate the effect of microalloying on the ductility of monocrystalline NiAl. The idea was to deposit selected elements on oriented crystals of NiAl using magnetron sputtering, followed by annealing at high temperatures to produce the doped specimens. The project was terminated before that stage of the research was reached, but useful results needed for that study were obtained during the lifetime of the program. Those results are described in this report.

Derived from text

*Nickel Alloys; Nickel Aluminides; Annealing; Miniaturization; Single Crystals; Bend Tests; Magnetron Sputtering*

**19980004632** NERAC, Inc., Tolland, CT USA

**Adhesive Bonding of Aluminum and Aluminum Alloys (Latest citations from the Ei Compendex\*Plus Database)**

Oct. 1996; In English; Page count unavailable

Report No.(s): PB97-850713; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, testing, and evaluation of adhesive bonding of aluminum and aluminum alloys. Topics include adhesively bonded joints, bond durability, aluminum structures, environmental effects, aging effects, and laminated materials. Citations also discuss applications in automobile, construction, and aircraft industries. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Adhesive Bonding; Aluminum Alloys; Bonded Joints; Metal Bonding; Bibliographies*

**19980004655** NERAC, Inc., Tolland, CT USA

**Corrosion Resistance of Stainless Steels. (Latest Citations from Information Services in Mechanical Engineering Database)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-858691

Report No.(s): PB97-854566; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the corrosion protection, corrosion prevention, and corrosion resistance of stainless steels. The effects of impurities and inclusions on corrosion resistance, as well as factors contributing to pitting, stress, and intergranular corrosion, are included. Methods to improve the passivity of stainless steel surfaces are discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Corrosion Resistance; Stainless Steels*

**19980004690** NERAC, Inc., Tolland, CT USA

**Thermal Spray Ceramic Coatings. (Latest citations from METADEX)**

May 1997; In English; Page count unavailable. Supersedes PB96-862784.

Report No.(s): PB97-860399; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the application of ceramic coatings by thermal spraying. The coatings discussed include alumina, yttrium oxide, carbides, and nitrides. Citations focus on plasma spraying, tribology, processing, and contact fatigue.

NTIS

*Aluminum Oxides; Bibliographies; Ceramic Coatings; Plasma Spraying; Yttrium Oxides; Nitrides*

**19980004713** Swedish Inst. for Metals Research, Stockholm, Sweden

**Effect of Sintering Parameters and of Composition of Fe-Mn-Si Master Alloy Powders in Astaloy 85Mo Sintered Steel**

Zhang, Z., Swedish Inst. for Metals Research, Sweden; Frisk, K., Swedish Inst. for Metals Research, Sweden; Hultman, L., Swedish Inst. for Metals Research, Sweden; 1997; 43p; In English

Report No.(s): PB97-209191; IM-3488; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Astaloy 85Mo-4%Fe-Si-Mn-0.5%C alloy was investigated, and sintered in pure hydrogen and nitrogen with 10% hydrogen. Different types of Fe-Si-Mn master alloys, sintering temperatures, sintering times and dew points of the atmospheres were selected. The aim is to find suitable sintering parameters to obtain good properties of Astaloy 85Mo sintered steel with Fe-Si-Mn master alloy, so that the alloy can be produced in industrial scale.

NTIS

*Sintering; Iron Alloys; Silicon Alloys; Powder Metallurgy; Manganese Alloys*

**19980004714** Swedish Inst. for Metals Research, Stockholm, Sweden

**Techniques for Studying Repassivation Processes. A Literature Review**

Luukkonen, P., Swedish Inst. for Metals Research, Sweden; May 1997; 37p; In English

Report No.(s): PB97-209183; IM-3485; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A literature review of different techniques for investigating repassivation processes for passivating metals is presented. The aim was to identify methods which could be used to evaluate the repassivation of stainless steels in chloride environment, and so related repassivation characteristics to stress corrosion cracking susceptibility. There are a wide range of different techniques to depassivate the metal surface; these include potential step techniques (electrochemical techniques), straining and scratching (mechanical techniques) and laser depassivation.

NTIS

*Stainless Steels; Passivity; Metal Surfaces*

**19980004715** Swedish Inst. for Metals Research, Stockholm, Sweden

**Simulation of Texture Development during Axisymmetric Compression and Tension**

Poizat, L., Swedish Inst. for Metals Research, Sweden; Hutchinson, B., Swedish Inst. for Metals Research, Sweden; Mar. 1997; 46p; In e

Report No.(s): PB97-209175; IM-3469; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental and theoretical study has been made of textures developed in aluminium alloys during high temperature deformation. The experiments were carried out on AA 6082 alloy which resists recrystallization due to a high density of small dispersoids. Compression textures are (110) fibre textures and become sharper on raising the deformation temperature from ambient to 530 deg C. There is also a small tendency for stabilization orientations near to (100). These trends are supported by the computer models although the predictions of these are only weakly dependent on choice of slip systems and strain rate sensitivity. Predictions of tension textures are much more sensitive to these factors and give results consistent with behavior during high temperatures extrusion.

NTIS

*Computerized Simulation; Aluminum Alloys; Textures; Compression Loads*

**19980004732** International Trade Commission Library, Washington, DC USA

**Manganese Metal from the People's Republic of China Final Report**

Dec. 1995; 124p; In English

Report No.(s): PB96-151162; USITC/PUB-2939; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

On the basis of the record developed in the subject investigation, the Commission determines, pursuant to section 735(b) of the Tariff Act of 1930 (19 U.S.C section 1673d(b)) (the Act), that an industry in the USA is materially injured by reason of imports from the People's Republic of China (China) of manganese metal, provided for in subheadings 8111.00.45 and 8111.00.60 of the Harmonized Tariff Schedule of the USA, that have been found by the Department of Commerce to be sold in the USA at Less Than Fair Value (LTFV).

NTIS

*China; Manganese; Metals*

**19980004744** Commissariat a l'Energie Atomique, Dept. d'Etudes des Materiaux, Grenoble, France

**Development of a high specific stiffness mechanically milled FeAl intermetallic alloy**

Baccino, R., Commissariat a l'Energie Atomique, France; Sanfilippo, D., Commissariat a l'Energie Atomique, France; Martel, P., Commissariat a l'Energie Atomique, France; Moret, F., Commissariat a l'Energie Atomique, France; 1995; 8p; In English; International Conference on Aerospace Defense and Demanding Applications, 8-10 May 1995, Anaheim, CA, USA

Report No.(s): CEA-CONF-12360; CONF-9505296; DE97-611916; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche



Powder metallurgy techniques such as gas atomization and mechanical milling have been used to develop a FeAl alloy with enhanced ductility and strength at both low and high temperature. The improvement method combines ductility increase by grain boundary strengthening, grain size reduction and oxide dispersion strengthening. The material has been characterized and tested in the form of extruded bars. Microstructure, order and texture of as-extruded and heat treated samples have been studied by TEM, X-ray diffraction and Moessbauer spectroscopy. Physical and mechanical properties of the material are compared to some conventional engineering alloys in order to discuss the conceivable applications in aeronautical and automotive industries.

DOE

*Ductility; Extruding; Grain Boundaries; High Temperature; Industries; Intermetallics; Low Temperature; Mechanical Properties; Microstructure; Powder Metallurgy*

**19980004750** Brookhaven National Lab., Upton, NY USA

**Inelastic x-ray scattering as a probe of electronic excitations: Solid and liquid metals**

Hill, J. P., Brookhaven National Lab., USA; [1996]; 19p; In English; Symposium on Complimentary Use of Neutron and X-Ray Scattering for Condensed Matter Research, 25 Oct. 1996, Wako, Japan

Contract(s)/Grant(s): DE-AC02-76CH-00016

Report No.(s): BNL-63696; CONF-9610227-1; DE97-001762; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Use of inelastic x-ray scattering to study excitations in condensed matter systems is discussed with emphasis on complementarity with inelastic neutron scattering. In particular, studies of electronic excitations in simple metals are detailed. A long standing controversy on the role of crystalline long range order on electron dynamics at intermediate momentum transfers is resolved by comparison of response functions obtained in liquid and solid phase of Li, Na, and Al. They show that the overall shape of the response function is unchanged on melting, implying that it is not determined by the long range order of the ion cores. Conversely, orientationally independent fine structure disappears on melting and therefore must be attributed to band structure-induced transitions, not many-body effects as had previously been argued. At small  $q$ , the plasmon lifetime and dispersion remain unchanged on melting. Other experiments are also briefly reviewed.

DOE

*Condensed Matter Physics; Crystallinity; Inelastic Scattering; Neutron Scattering; X Ray Scattering*

**19980004753** Argonne National Lab., IL USA

**Strain measurements in thermally grown alumina scales using ruby fluorescence**

Veal, B. W., Argonne National Lab., USA; Natesan, K., Argonne National Lab., USA; Koshelev, I., Argonne National Lab., USA; Grimsditch, M., Argonne National Lab., USA; Renusch, D., Argonne National Lab., USA; Hou, P. Y., California Univ., Lawrence Berkeley Lab., USA; [1996]; 13p; In English; 190th Meeting of the Electrochemical Society and Technical Exhibition, 6-11 Oct. 1996, San Antonio, TX, USA

Contract(s)/Grant(s): W-31-109-eng-38; RP-8041-05

Report No.(s): ANL/MSD/CP-91224; CONF-961040-15; DE97-001409; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We have measured strains in alumina scales thermally grown on Fe-Cr-Al alloys by exploiting the strain dependence of the ruby luminescence line. Measurements were done on Fe-5Cr-28Al and Fe-18Cr-10Al (at.%, bal. Fe) oxidized between 300-1300 C with periodic cycling to room temperature. Significantly different levels of strain buildup were observed in scales on these alloys. Results on similar alloys containing a dilute reactive element (Zr or Hf) are also presented. We observe that scales on alloys containing a reactive element (RE) can support higher strains than scales on RE-free alloys. With the luminescence technique, strain relief associated with spallation thresholds is readily observed. In early stage oxidation, the evolution of transition phases is monitored using Raman and fluorescence spectroscopies. The fluorescence technique also provides a sensitive probe of early stage formation of  $(\alpha)\text{-Al}(\text{sub } 2)\text{O}(\text{sub } 3)$ . It appears that, in presence of  $\text{Cr}(\text{sub } 2)\text{O}(\text{sub } 3)$  or  $\text{Fe}(\text{sub } 2)\text{O}(\text{sub } 3)$ , the  $(\alpha)\text{-alumina}$  phase can form at anomalously low temperatures.

DOE

*Aluminum Alloys; Aluminum Oxides; Chromium Alloys; Iron Alloys; Raman Spectroscopy; Strain Measurement*

**19980004800** Japan Atomic Energy Research Inst., Tokai, Japan

**Measurement test on creep strain rate of uranium-zirconium solid solutions**

Ogata, Takanari, Japan Atomic Energy Research Inst., Japan; Akabori, Mitsuo, Japan Atomic Energy Research Inst., Japan; Ogawa, Toru, Japan Atomic Energy Research Inst., Japan; Nov. 1996; 23p; In Japanese

Report No.(s): JAERI-Tech-96-052; DE97-736294; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In order to measure creep strain rate of a small specimen of U-Zr solid solution, authors proposed an estimation method which was based upon the stress relaxation after compression. It was applied to measurement test on creep strain rate of the U-10 wt%Zr specimen in the temperature range of 757 to 911 C. It may be concluded that the proposed method is valid, provided that the strain is within the appropriate range and that sufficient amount of the load decrement is observed. The obtained creep rate of U-10 wt%Zr alloy indicated significantly smaller value, compared to the experimental data for pure U metal and evaluated data for U-Pu-Zr alloy. However, more careful measurement is desired in future since the present data are thought to be influenced by the precipitations included in the specimen.

DOE

*Creep Properties; Stress Relaxation; Uranium Compounds*

**19980005117** Pennsylvania State Univ., Dept. of Chemistry, University Park, PA USA

**Clusters of Transition Metal Compounds: Building Blocks of New Materials** *Final Report, 1 Apr. 1994 - 31 May 1997*

Castleman, A. W., Jr., Pennsylvania State Univ., USA; May 30, 1997; 34p; In English

Contract(s)/Grant(s): F49620-94-I-0162; AF Proj. 2303

Report No.(s): AD-A329756; AFOSR-TR-97-0361; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One of the great challenges facing the materials field is developing suitable methods for designing new materials with chosen properties. Assembling ones from clusters, i.e., producing nanostructure or cluster assembled materials, is a promising approach that we are exploring. The research program commenced April 1, 1994, with work devoted to an investigation of Met-Cars and related small metal compound clusters. During the course of this study we found that binary metal Met-Cars, even comprised of metals that do not yield the pure Met-Car structure, can be formed. This gives promise of attaining the ability to tailor the design of materials of specific desired properties. In related studies, we found that Met-Cars undergo a substantially delayed ionization mechanism analogous to thermionic emission, which further points to their unique electronic properties. During the course of the program, we made valuable progress in elucidating mechanisms of formation and characterizing the bonding and structure of Met-Cars. Investigations of collision-induced dissociation revealed the unique stability of the  $\text{MaCi}_2$  stoichiometry and provided new evidence for the nature of the bonding of the lattice cage. An investigation of Met-Car adducts also has provided further understanding of the stability and bonding of various ligation complexes, and showed an analogy between their adsorption to Met-Cars and to their bonding with certain metal surfaces. These findings are yielding new information about Met-Cars, as well as the nature of new complexes which can be formed from these nanophase materials. In addition to studies devoted to determining their mechanisms of formation and their physical and chemical properties in gas-phase experiments, effort has been underway to develop efficient methods of synthesizing the bulk materials.

DTIC

*Transition Metals; Molecular Clusters; Research*

**19980005123** Defence Science and Technology Organisation, Airframes and Engines Div., Canberra, Australia

**Characterisation of D6AC Steel Using A Unified Constitutive Model**

Searl, A., Defence Science and Technology Organisation, Australia; Paul, J., Defence Science and Technology Organisation, Australia; Jul. 1997; 50p; In English

Report No.(s): AD-A329896; DSTO-TR-0556; DODA-AR-010-282; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental test program was undertaken to characterise the inelastic response of D6AC steel under differing cyclic loading. A unified constitutive model was used to describe material behaviour. Constants for the model were extracted from the test results and numerical model predictions were compared with the experimental results. The tests revealed that D6AC steel saturates after one cyclic loop and a change in modulus was observed after unloading from a tensile load. Also described are improvements in the testing of uniaxial specimens, focusing on techniques for specimen alignment to minimise out of plane bending effects.

DTIC

*Bending; Mathematical Models; Steels; Unloading*

**19980005231** Finnish Centre for Radiation and Nuclear Safety, Helsinki, Finland

**Corrosion behaviour of zinc and aluminium in simulated nuclear accident environments**

Piippo, Juha, Technical Research Centre of Finland, Finland; Laitinen, Timo, Technical Research Centre of Finland, Finland; Sirkia, Pekka, Technical Research Centre of Finland, Finland; Feb. 1997; 30p; In English

Report No.(s): STUK-YTO-TR-123; DE97-624293; ISBN 951-712-177-6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The corrosion rates of zinc and aluminium were determined in simulated large pipe break and in severe accident cases. An in situ on fine measurement technique, which is based on the resistance measurement of sample wires, was used. In the large pipe break case the corrosion rates of zinc and aluminium were determined at pH 8 and pH 10 in deaerated and in aerated solutions. Tests were also performed in aerated 0.1 M borate buffer solution at pH 9.2. Temperature range was 130 deg C - 50 deg C. The corrosion of zinc appears to be relatively fast in neutral or mildly alkaline aerated water, while both high pH and deaeration tend to reduce the corrosion rates of zinc. The aeration and pH elevation decrease the corrosion rate of aluminium. The simulation of the severe accident case took place in the pH range 3-11 in chloride containing solutions at 50 deg C temperature. The corrosion rate of aluminium was lower than that of zinc, except for the solution with pH 11, in which the corrosion rate of aluminium was practically identical to that of zinc. Both metals corroded more rapidly in the presence of chlorides in acidic and alkalic conditions than in the absence of chlorides at neutral environment. The solubility of zinc and aluminium and the stability of the corrosion products were estimated using thermodynamical calculations. The experimental results and the thermodynamical calculations were in fair agreement.

DOE

*Aluminum; Buffers (Chemistry); Corrosion; Degassing; Elevation; Estimating; Heat of Solution; In Situ Measurement; Pipes (Tubes)*

**19980005255** NERAC, Inc., Tolland, CT USA

**Pipeline Corrosion. (Latest Citations from the NTIS Bibliographic Database)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-858659

Report No.(s): PB97-854483; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the corrosion of pipelines in aquatic and terrestrial environments. Citations discuss corrosion resistant materials and protective coatings for the design and construction of gas pipelines, water pipelines, and sewers. Topics include cathodic protection, microbial corrosion and degradation, corrosion inspection systems, and pipeline failures and consequences. References to offshore and underground gas transportation, water distribution systems, nuclear power plants, and district heating systems are also included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Pipelines; Corrosion*

**19980005354** Air Force Inst. of Tech., Airframes and Engines Div., Wright-Patterson AFB, OH USA

**Investigating the Effects of Corrosion on the Fatigue Life of Steel**

Waldvogel, Todd S., Air Force Inst. of Tech., USA; Sep. 30, 1997; 52p; In English

Report No.(s): AD-A329923; AFIT-97-032; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Given the size of this country's vast infrastructure and the increasingly competitive environment for fiscal support, it is important that maintenance funds be appropriately allocated. Many structural components of our infrastructure are affected by the corrosion process. By most accounts, corrosion is typically considered to provide only negative effects on structural systems. Argument can be made, however, that corrosion may in fact deter fatigue crack initiation in low stress cyclic loading. A testing procedure to investigate the effects of corrosion on the fatigue life of steel is established, completed, and evaluated. Twenty-four steel specimens are immersed in a saltwater solution and removed on intervals for repetitive loading. Once tested, the surviving specimens are returned to the saline solution. This process is continued until each specimen fails. The results show that 22 of 24 corroded specimens had higher mean fatigue lives than the mean non-corroded fatigue life when subjected to this intermediate corrosion and low stress range cyclic tension loading.

DTIC

*Fatigue Life; Structural Design; Steels; Corrosion; Sea Water*

**19980005376** Argonne National Lab., IL USA

**Implications of the unusual redox behavior exhibited by the teteropolyanion [EuP5W30O110](sup 12-)**

Antonio, M. R., Argonne National Lab., USA; Soderholm, L., Argonne National Lab., USA; [1996]; 10p; In English; 21st; Rare Earth Research Conference, 7-12 Jul. 1996, Duluth, MN, USA

Contract(s)/Grant(s): W-31-109-eng-38

Report No.(s): ANL/CHM/CP-89931; CONF-960796-8; DE97-002000; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We report on the novel electrochemical behavior of the heteropolyanion [EuP5W30O110](sup -12), with emphasis on the Eu valence in both the oxidized and reduced forms. In aqueous electrolytes, the P-W-O framework is electroactive and can revers-

ibly accept up to 10 electrons before the potential becomes reducing enough for H<sub>2</sub> evolution. Eu L<sub>3</sub>-edge x-ray absorption near edge structure (XANES) results demonstrate that Eu is also electroactive under the same conditions. Implications of this work are discussed re long-standing questions about intermediate-valent materials.

DOE

*Oxidation-Reduction Reactions; Europium Compounds*

**19980005593** NERAC, Inc., Tolland, CT USA

**Silver-Cadmium Alloys: Physical and Metallurgical Properties (Latest citations from the Ei Compendex\*Plus Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870340; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the metallurgical and physical properties of silver-cadmium alloys, oxides, and sulfides. The phase relationships and crystal structure of this alloy system are presented. Applications for electrical contact devices are discussed extensively.

NTIS

*Bibliographies; Silver Alloys; Crystal Structure; Cadmium Alloys*

**19980005663** Nuclear Energy Agency, Committee on the Safety of Nuclear Installations, Paris, France

**Irradiation Embrittlement and Optimisation of Annealing**

1993; 557p; In English; International Atomic Energy Agency (IAEA) Specialist Meeting on Irradiation Embrittlement and Optimization of Annealing, 20 -23 Sep. 1993, Paris, France

Report No.(s): NEA-CSNI-R-94-1; CONF-9309237; DE97-620233; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche; US Sales Only; US Sales Only

This conference is composed of 30 papers grouped in 6 sessions related to the following themes: neutron irradiation effects in pressure vessel steels and weldments used in PWR, WWER and BWR nuclear plants; results from surveillance programmes (irradiation induced damage and annealing processes); studies on the influence of variations in irradiation conditions and mechanisms, and modelling; mitigation of irradiation effects, especially through thermal annealing; mechanical test procedures and specimen size effects.

DOE

*Annealing; Embrittlement; Irradiation; Neutron Irradiation; Radiation Effects; Thermal Energy; Pressure Vessels; Optimization*

**19980005664** China Nuclear Information Centre, Beijing, China

**XPS study on the surface reaction of uranium metal with carbon monoxide at 200 C**

Wang Xiao-Ling, Southwest Inst. of Nuclear Physics and Chemistry, China; Fu, Yi-Bei, Southwest Inst. of Nuclear Physics and Chemistry, China; Xie, Ren-Shou, Southwest Inst. of Nuclear Physics and Chemistry, China; Huang, Rui-Liang, Southwest Inst. of Nuclear Physics and Chemistry, China; Dec. 1996; 11p; In Chinese

Report No.(s): CNIC-1134; SINPC-0006; DE97-620062; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The surface reaction of uranium metal with carbon monoxide at 200 C has been studied by X-ray photoelectron spectroscopy (XPS). The carbon monoxide adsorption on the surface oxide layer resulted in U4f peak shifting to the lower binding energy and the content of oxygen in the oxide is decreased. O/U ratio decreases with increasing the exposure of carbon monoxide to the surface layer. The investigation indicated the surface layer of uranium metal was further reduced in the atmosphere of carbon monoxide at high temperature.

DOE

*Adsorption; Carbon Monoxide; Photoelectron Spectroscopy; Surface Reactions; Uranium; Oxygen*

**19980005666** Lehigh Univ., Dept. of Mechanical Engineering and Mechanics, Bethlehem, PA USA

**Corrosion and Fatigue of Aluminum Alloys: Chemistry, Micro-Mechanics and Reliability Final Report, 1 Jul. 1993 - 31 Mar. 1997**

Wei, Robert P., Lehigh Univ., USA; May 12, 1997; 35p; In English

Contract(s)/Grant(s): F49620-93-01-0426

Report No.(s): AD-A329634; AFOSR-TR-97-0434; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Lehigh University undertook a multidisciplinary program of research to develop a basic mechanistic understanding of localized corrosion and corrosion fatigue crack nucleation and growth in aluminum alloys used in aircraft construction, and to begin to formulate mechanistically based probability models for reliability assessments based on this understanding. The objectives of the program are: (1) the development of basic understanding of the processes of localized corrosion and corrosion fatigue crack nucleation and growth in high strength aluminum alloys used in airframe construction, (2) the formulation of kinetic models for these elemental processes, and (3) the integration of these models into probabilistic models that can provide guidance in formulating methodologies for service life prediction. The effort included a study of the feasibility for incorporating the mechanistically based probability models into appropriate fatigue analysis codes (such as MODGRO). This final technical report summarizes research completed under this grant and reflects contributions from the companion program sponsored by the Aging Airplanes Program of the Federal Aviation Administration (FAA) under Grant No. 92-G-0006.

DTIC

*Aluminum Alloys; Corrosion; Aircraft Structures; Fatigue (Materials); High Strength Alloys; University Program; Multidisciplinary Research; Crack Propagation; Metal Fatigue; Life (Durability); Service Life; Reliability*

**19980006283** Pennsylvania State Univ., Center for Advanced Materials, University Park, PA USA

**Development of Analytical Methods for Predicting Damage Functions for Pitting Corrosion in Condensing Heat Exchangers. Final Technical Report, August 1993-February 1995 Final Report, Aug. 1993 - Feb. 1995**

Engelhardt, G., Pennsylvania State Univ., USA; Macdonald, D. D., Pennsylvania State Univ., USA; Urquidi-Macdonald, M., Pennsylvania State Univ., USA; Liu, C., Pennsylvania State Univ., USA; Jan. 13, 1997; 100p; In English

Contract(s)/Grant(s): GRI-95-0233

Report No.(s): PB97-157739; CAM-9425; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Analytical methods have been developed for simulating the development of pitting corrosion damage on stainless steel surfaces in gas-fired condensing heat exchangers. These methods make use of deterministic models for the nucleation, growth, and repassivation of pits on the metal surface as a function of condensate chemistry, conductivity, the electrochemical properties of the substrate (corrosion potential), the nucleation site density on the surface, the defect structure of the passive film, and the first-order kinetics of repassivation of existing pits.

NTIS

*Condensates; Condensing; Corrosion; Gas Exchange; Heat Exchangers; Metal Surfaces; Nucleation; Predictions; Simulation; Stainless Steels; Steels; Substrates*

**19980006306** Japan Atomic Energy Research Inst., Dept. of Materials Science and Engineering, Tokai, Japan

**High temperature oxidation characteristics of developed Ni-Cr-W superalloys in air**

Suzuki, Tomio, Japan Atomic Energy Research Inst., Japan; Shindo, Masami, Japan Atomic Energy Research Inst., Japan; Nov. 1996; 26p; In Japanese

Report No.(s): JAERI-Tech-96-051; DE97-729544; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

For expanding utilization of the Ni-Cr-W superalloy, which has been developed as one of new high temperature structural materials used in the advanced High Temperature Gas-cooled Reactors (HTGRs), in various engineering fields including the structural material for heat utilization system, the oxidation behavior of this alloy in air as one of high oxidizing environments becomes one of key factors. The oxidation tests for the industrial scale heat of Ni-Cr-W superalloy with the optimized chemical composition and five kinds of experimental Ni-Cr-W alloys with different Cr/W ratio were carried out at high temperatures in the air compared with Hastelloy XR. The conclusions were obtained as follows. (1) The oxidation resistance of the industrial scale heat of Ni-Cr-W superalloy with the optimized chemical composition was superior to that of Hastelloy XR. (2) The most excellent oxidation resistance was obtained in an alloy with 19% Cr of the industrial scale heat of Ni-Cr-W superalloy.

DOE

*Advanced Test Reactors; Chemical Composition; Heat Resistant Alloys; High Temperature; High Temperature Gas Cooled Reactors*



## 27 NONMETALLIC MATERIALS

*Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.*

**19980003904** NERAC, Inc., Tolland, CT USA

**Foamed Plastics: Polyurethane Foams. (Latest citations from the NTIS Bibliographic Database)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-859582.

Report No.(s): PB97-852008; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the fabrication, physical properties, chemical characteristics, and applications of polyurethane foams. Applications in thermal insulation, vehicle bumpers, roofing systems, structural panels, packing materials, and upholstery materials are discussed. Also discussed are flammability testing, thermal and mechanical properties, and toxicity.

NTIS  
*Bibliographies; Plastics; Polyurethane Foam; Flammability; Thermal Insulation*

**19980003908** NERAC, Inc., Tolland, CT USA

**Rubber to Metal Bonding (Latest citations from the US Patent Bibliographic File with Exemplary Claims)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851075; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning adhering elastomers, including silicone and vulcanized rubbers, to metal substrates. Selected patents include methods and compositions for bonding rubbers to metals, alloys, and steels. Design and fabrication of composite materials for adhesion promoters are also included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS  
*Bibliographies; Metal Bonding; Rubber; Bonded Joints*

**19980003913** NERAC, Inc., Tolland, CT USA

**Coating Adhesion Testing (Latest citations from the INSPEC Database)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851190; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning adhesion analysis, evaluation, and testing of coatings and films on metal and non-metal substrates. References to spectroscopic and acoustic emission analyses, polymer and metal coatings, scratch tests, mechanical and chemical adhesion properties, adhesion failures and defects, and wear-resistant coatings are presented. Methods of coating are discussed, including sputtering, thermal spray, vapor deposition, and electroless types.

NTIS  
*Bibliographies; Chemical Properties; Vapor Deposition; Spectroscopic Analysis; Metal Coatings; Electroless Deposition; Defects; Acoustic Emission; Adhesion*

**19980003929** Akron Univ., Polymer Science Dept., Akron, OH USA

**Structure-Property Relationships of Bismaleimides**

Tenteris-Noebe, Anita D., Akron Univ., USA; Dec. 1997; 347p; In English

Contract(s)/Grant(s): NAG3-1498

Report No.(s): NASA/CR-97-206411; NAS 1.26:206411; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

The purpose of this research was to control and systematically vary the network topology of bismaleimides through cure temperature and chemistry (addition of various coreactants) and subsequently attempt to determine structure-mechanical property relationships. Characterization of the bismaleimide structures by dielectric, rheological, and thermal analyses, and density measurements was subsequently correlated with mechanical properties such as modulus, yield strength, fracture energy, and stress relaxation. The model material used in this investigation was 4,4'-Bismaleimidodiphenyl methane (BMI). BMI was coreacted with either 4,4'-Methylene Dianiline (MDA), o,o'-diallyl bisphenol A (DABA) from Ciba Geigy, or Diamino Diphenyl Sulfone (DDS). Three cure paths were employed: a low-temperature cure of 140 C where chain extension should predominate, a high-temperature cure of 220 C where both chain extension and crosslinking should occur simultaneously, and a low-temperature (140 C)

cure followed immediately by a high-temperature (220 C) cure where the chain extension reaction or amine addition precedes BMI homopolymerization or crosslinking. Samples of cured and postcured PMR-15 were also tested to determine the effects of postcuring on the mechanical properties. The low-temperature cure condition of BMI/MDA exhibited the highest modulus values for a given mole fraction of BMI with the modulus decreasing with decreasing concentration of BMI. The higher elastic modulus is the result of steric hindrance by unreacted BMI molecules in the glassy state. The moduli values for the high- and low/high-temperature cure conditions of BMI/MDA decreased as the amount of diamine increased. All the moduli values mimic the yield strength and density trends. For the high-temperature cure condition, the room- temperature modulus remained constant with decreasing mole fraction of BMT for the BMI/DABA and BMI/DDS systems. Postcuring PMR-15 increases the modulus over that of the cured material even though density values of cured and postcured PMR were essentially the same. Preliminary results of a continuous and intermittent stress relaxation experiment for BMI:MDA in a 2:1 molar ratio indicate that crosslinking is occurring when the sample is in the undeformed state. Computer simulation of properties such as density, glass transition temperature, and modulus for the low- temperature cure conditions of BMI/MDA and BMI/DABA were completed. The computer modeling was used to help further understand and confirm the structure characterization results. The simulations correctly predicted the trends of these properties versus mole fraction BMI and were extended to other BMI/diamine systems.

Author

*Bismaleimide; Topology; Mechanical Properties; Dielectric Properties*

**19980003955** Sandia National Labs., Albuquerque, NM USA

**Low density, microcellular, dopable, agar/gelatin foams for pulsed power experiments**

McNamara, W. F., Orion International Technologies, USA; Aubert, J. H., Sandia National Labs., USA; Apr. 1997; 26p; In English  
Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-0689; DE97-005182; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Low-density, microcellular foams prepared from the natural polymers agar and gelatin have been developed for pulsed-power physics experiments. Numerous experiments were supported with foams having densities at or below 10 mg/cm<sup>3</sup>. For some of the experiments, the agar/gelatin foam was uniformly doped with metallic elements using soluble salts. Depending on the method of preparation, cell sizes were typically below 10 microns and for one process were below 1.0 micron.

DOE

*Ion Beams; Laser Targets; Plastics; Foams*

**19980003959** NERAC, Inc., Tolland, CT USA

**Intumescent Materials. (Latest citations from the U.S. Patent Bibliographic File with Exemplary Claims)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-859863.

Report No.(s): PB97-852016; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the composition and use of intumescent materials for fire protection. Patents discuss coatings, seals, enclosures, protective coverings and sheaths, self-extinguishing compositions, and fire-stop couplings. Citations also describe applications in electrical outlets, sheeting and paneling materials, power and communication cables, and gasketing.

NTIS

*Fire Prevention; Bibliographies; Extinguishing; Fires; Communication Cables*

**19980003988** NERAC, Inc., Tolland, CT USA

**Coating Friction (Latest citations from the NTIS Bibliographic Database)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851042; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the properties and applications of coatings as related to friction. Coatings applied to metals and alloys used in extreme high or low temperatures environments are examined. Wear characteristics, structure, and performance evaluations of specific coatings are included. Applications in bearings, combustion cylinders, shafts, guideways, and bushings are discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Friction; Protective Coatings*

**19980004039** NERAC, Inc., Tolland, CT USA

**Polymers in Vibration Damping and Soundproofing. (Latest citations from the U.S. Patent Bibliographic File with Exemplary Claims)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-855218.

Report No.(s): PB97-851711; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning synthetic resin compositions which demonstrate vibration damping and soundproofing properties. Thermoplastic and thermosetting plastics and elastomers are discussed relative to fillers, modifiers, reinforcing agents, molding processes, laminating structures, and coating compositions. Aeronautics, sporting goods, manufacturing, and electrical engineering are among the applications discussed.

NTIS

*Composite Materials; Thermoplasticity; Synthetic Resins; Vibration Damping; Bibliographies; Elastomers; Laminates*

**19980004043** NERAC, Inc., Tolland, CT USA

**Glass Ceramics. (Latest citations from the NTIS Bibliographic Database)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-859517.

Report No.(s): PB97-851992; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, development, evaluation, and applications of glass ceramics. Citations discuss fabrication and testing of glass ceramic materials for high strength, high thermal expansion, and high voltage applications. Applications in lasers, solar concentrators, metal seals and metal bondings, pyrotechnic devices, insulators for vacuum tubes, nuclear waste treatment, capacitance thermometers, millimeter wave devices, biomaterials, and automobile thermal reactors are examined.

NTIS

*Bibliographies; Ceramics; Bonding; Thermal Expansion; High Strength; Glass; Seals (Stoppers); Pyrotechnics*

**19980004044** NERAC, Inc., Tolland, CT USA

**High Temperature Lubricants . (Latest citations from the U.S. Patent Bibliographic File with Exemplary Claims)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-859152.

Report No.(s): PB97-851984; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning high temperature synthetic and natural lubricating compositions. Thickening agents, thermal stabilizers, polymeric additives, antioxidants, and preservatives are included relative to such lubricants as greases, oils, and soaps. Manufacturing methods and various applications are included.

NTIS

*Bibliographies; High Temperature Lubricants; Lubrication; Manufacturing; Greases*

**19980004046** NERAC, Inc., Tolland, CT USA

**Radiation Curing of Polymers (Latest citations from the Ei Compindex\*Plus Database)**

Oct. 1996; In English; Page count unavailable

Report No.(s): PB97-850895; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the radiation crosslinking of thermoplastic and thermosetting plastics and elastomers. Energy efficiency and performance of polymer curing by such radiation as ultraviolet, microwave and infrared wavelengths are discussed relative to such materials as polymeric coatings, adhesives, elastomers, and epoxy resins. Hazards of radiation curing of polymers as well as applications of the electron processed plastics are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Plastics; Elastomers; Polymerization; Curing*

**19980004052** NERAC, Inc., Tolland, CT USA

**Shock Absorbing Elastomers: Design and Applications (Latest citations from the Rubber and Plastics Research Association Database)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851059; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning designs and applications of elastomeric shock absorbers. Materials include thermoplastic elastomers, silicone elastomers, polyurethane elastomers, polyester elastomers, ethylene-propylene terpolymer (EPDM) elastomers, and neoprene elastomers. Applications in space vehicles, automotive vibration damping, bicycle saddles, bumpers, fenders, cable tensioners, and energy accumulators are presented. Testing of the shock damping properties of these materials is also examined. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Shock Absorbers; Elastomers; Vibration Damping*

**19980004053** NERAC, Inc., Tolland, CT USA

**Corrosion Prevention: Conversion Coatings and Coating Processes (Latest citations from the Ei Compendex\*Plus Database)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851034; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning conversion coatings and coating processes for the prevention and elimination of metal corrosion in commercial, industrial, and marine environments. Conversion coating processes for the application of chromates, phosphates, and black oxides to the surfaces of aluminum, zinc, steels, magnesium, and various other alloys are discussed. Topics include coating compositions, properties and structure analysis of coated surfaces, rust converters, energy conservation in coating processes, surface preparation and pretreatment prior to coating application, and decorative coatings. Specific chromate and phosphate non-conversion coatings for aluminum, steels, and zinc alloys are excluded and detailed in separate bibliographies. Additional information is also available in a separate bibliography from World Surface Coatings Database under a similar title. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Corrosion Prevention; Protective Coatings; Coating*

**19980004061** NERAC, Inc., Tolland, CT USA

**Chemical Vapor Deposition (Latest citations from the NTIS Bibliographic Database)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851133; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning chemical vapor deposition of carbon, carbides, ceramics, metals, and glasses. Applications include optical coatings, semiconducting films, laser materials, solar cells, composite fabrication, and nuclear reactor material fabrication. Included are the physical, mechanical, and chemical properties of these coatings. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Vapor Deposition; Ceramic Coatings; Glass Coatings; Metal Coatings; Antireflection Coatings; Bibliographies*

**19980004063** NERAC, Inc., Tolland, CT USA

**High Performance Elastomers (Latest citations from the Rubber and Plastics Research Association Database)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851067; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the properties and applications of high performance elastomers. Materials discussed include fluorosilicone rubber, urethanes, flexomers, polyolefins, polyphosphazenes, hydrogenated elastomers, polymer alloys, fluorocarbon elastomers, and caprolactones. Hardness, heat resistance, flame resistance, radiation resistance, and processability are among the properties discussed. Applications include shock absorbers, encapsulants, pressure sensitive adhesives, and electrical and electronic parts. Market projections and life prediction testing techniques for small and large parts are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Elastomers; Bibliographies; Polyurethane Resins; Thermosetting Resins*

**19980004081** Michigan Univ., Ann Arbor, MI USA

**Stereolithography Apparatus for Free Form Fabrication of Ceramics** *Final Report, 1 Jan. 1995 - 31 Dec. 1996*

Halloran, John W., Michigan Univ., USA; Aug. 25, 1997; 24p; In English

Contract(s)/Grant(s): N00014-95-I-0527

Report No.(s): AD-A329881; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During this grant we installed a 3D Systems SLA 250/40 stereolithography apparatus, and used it to directly fabricate ceramic green bodies from ultraviolet (UV) curable solutions which contain dispersed ceramic powders. We emphasized SLA of alumina as a structural ceramic and for investment casting cores. Viscosity was reduced with improved dispersion. The quality of the prototypes was improved by determination of appropriate build styles, and by optimization of photoinitiators and photoresins. The latter were studied by photo-differential scanning calorimetry, and photo-rheology.

DTIC

*Lithography; Three Dimensional Models; Cermets*

**19980004098** Iowa State Univ. of Science and Technology, Dept. of Mechanical Engineering, Ames, IA USA

**Modeling and Design Study Using HFC-236ea as an Alternative Refrigerant in a Centrifugal Compressor** *Final Report, Jan. 1994 - Sep. 1995*

Popovic, P., Iowa State Univ. of Science and Technology, USA; Shapiro, H. N., Iowa State Univ. of Science and Technology, USA; Apr. 1997; 176p; In English

Report No.(s): PB97-156129; EPA/600/13; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The Environmental Protection Agency (EPA) in cooperation with the Navy has been seeking a CFC-114 drop-in placement. One alternative HFC refrigerant which appears to satisfy all physical and chemical characteristics for the Navy fleet was found to be HFC-236ea refrigerant. The project represents a part of the investigation directed to evaluate this CFC-114 alternative refrigerant as a possible drop-in replacement in Navy chillers. The objective of the study was to conduct a thorough literature review regarding centrifugal compressors and the, on the basis of the information gathered, build an accurate but simple compressor model utilizing the available compressor experimental data. Further, the developed compressor model would be used to suggest eventual design adjustments to enhance compressor performance with the alternative HFC-236ea refrigerant.

NTIS

*Centrifugal Compressors; Refrigerants; Mathematical Models*

**19980004129** NERAC, Inc., Tolland, CT USA

**Biological Effects and Environmental Fate of Antifouling Substances: Latest citations from the Life Sciences Collection Database**

Jun. 1996; In English; Page count unavailable, Supersedes PB95-855649.

Report No.(s): PB96-871132; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning field and laboratory studies of the effects of antifouling substances on marine populations. Topics include toxicity tests, water and sediment pollution, bioaccumulation, effects on plant growth and metabolism, bacterial adhesion and biofilm formation, bioindicators, and pollution monitoring. Antifouling materials include copper, nickel, and organotin compounds.

NTIS

*Bibliographies; Antifouling; Nickel Compounds; Pollution Monitoring; Vegetation Growth; Water Pollution; Toxicity; Copper; Biological Effects; Bacteria*

**19980004529** Oak Ridge National Lab., TN USA

**Corrosion of ceramics in high temperature steam environments**

Keiser, J. R., Oak Ridge National Lab., USA; Howell, M., Oak Ridge National Lab., USA; Gondolfe, J. M., Stone and Webster Engineering Corp., USA; Arnold, D. T., Stone and Webster Engineering Corp., USA; 1997; 15p; In English; 52nd; Economics and Performance, 9-14 Mar. 1997, New Orleans, LA, USA; Sponsored by National Association of Corrosion Engineers, USA

Contract(s)/Grant(s): DE-AC05-96OR-22464

Report No.(s): CONF-970332-7; DE97-001644; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Ethylene is one of the principal building blocks in the petrochemical industry, and world-wide production and consumption have been steadily increasing. Production of ethylene is accomplished primarily by the pyrolytic stripping of hydrogen from ethane or a higher molecular weight hydrocarbon. This cracking process, sometimes referred to as steam cracking, is currently



accomplished in metallic tubes in high temperature furnaces with a conversion efficiency, for ethane of 60-65%. Operation at significantly higher temperature could increase the efficiency as much as 20%, but materials with better high temperature strength would be required. To help identify suitable materials, tests have been conducted to determine the behavior of selected ceramic materials in environments similar to those anticipated for a high-efficiency, advanced steam cracking system. The effects of exposure on weight change, mechanical strength, and microstructure have been determined in a series of 100 hour tests. In addition, 500 hour tests have been conducted to determine the effect of time on material behavior. From these tests, several strong candidates have been identified.

DOE

*Ceramics; Hydrocarbons; Hydrogen; Industries; Microstructure; Molecular Weight; Steam*

**19980004530** National Physical Lab., Teddington, UK

**Performance of Adhesive Joints, 1996-1999: Review of Durability Test Methods and Standards for Assessing Long Term Performance of Adhesive Joints, Report No. 1**

Broughton, W. R., National Physical Lab., UK; Mera, R. D., National Physical Lab., UK; May 1997; 79p; In English  
Report No.(s): PB97-197669; NPL-CMMT(A)-61; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report provides a critical appraisal of test methods and related standards used for the assessment of durability of adhesive joints under combined cycle or creep loading and hostile environments. Accelerated ageing methods/schemes and durability data for design requirements are included in the assessment. The test methods are assessed in terms of material compatibility, data generated, environmental and service conditions, long term performance, costs of implementation, ease of use, consistency of data, data reduction requirements and stress uniformity. Consideration is given to the practicality of using the test method in an industrial environment, in terms of ensuring 'fitness for purpose'. The review is based on information compiled from previous government funded research programs, a survey of industrial practices and requirements, and general literature.

NTIS

*Adhesive Bonding; Bonded Joints; Performance Tests*

**19980004548** NERAC, Inc., Tolland, CT USA

**Reinforced Structural Foam. (Latest Citations from the Rubber and Plastics Research Association Database)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-859392

Report No.(s): PB97-854608; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the incorporation of synthetic fiber reinforcement into the manufacture of polymeric structural foam. Glass, mica flakes, and carbon are among the reinforcing agents examined for such resins as polyurethane, polypropylene, and isocyanurate structural foams. Applications in the automobile, aircraft, sports, and appliance industries; considerations for reaction injection molding processes and materials; and economic ramifications are included. Constructions with honeycomb or sandwich structures are covered in separate bibliographies. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Foams; Reinforced Plastics; Reinforcing Materials*

**19980004554** NERAC, Inc., Tolland, CT USA

**Flame Retardant Plastics and Elastomers (Excluding Foams). (Latest citations from the Rubber and Plastics Research Association Database)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-862214

Report No.(s): PB97-854970; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning flame retarding and smoke suppressing chemical additives, fillers, and coatings for plastics and elastomers. Performance tests, properties, and applications for flame retardant and smoke suppressant plastics and elastomers are considered. Manufacturers and trade names are also included. Flame retardant plastic foams are included in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Elastomers; Flame Retardants; Plastics; Flammability*

**19980004622** National Physical Lab., Teddington, UK

**Performance of Adhesive Joints, 1996-1999: Review of Life Prediction Methodology and Adhesive Joint Design and Analysis Software, Report No. 2**

Broughton, W. R., National Physical Lab., UK; Mera, R. D., National Physical Lab., UK; Jun. 1997; 36p; In English  
Report No.(s): PB97-197677; NPL-CMMT(A)-62; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report reviews predictive models suitable for evaluating long-term properties, residual strength and life expectancy of adhesive joints subjected to cyclic fatigue and/or hostile environments. Methods for simulating accelerated ageing are included in the assessment. Several different approaches, including mechanistic models, fracture mechanics, stress analysis and phenomenological models are considered. The predictive techniques and models identified will be evaluated within a subsequent experimental programme. Parametric studies are to be carried out to determine the effect of temperature and the level of degrading agent with the degree of degradation, identifying any synergistic or superimposed effects between environmental and loading parameters. The report also reviews a number of commercially available finite element analysis (FEA) and non-FEA software packages used for design of adhesive joints and materials selection.

NTIS

*Adhesive Bonding; Bonded Joints; Residual Strength; Service Life; Prediction Analysis Techniques*

**19980004623** National Physical Lab., Centre for Materials Measurement and Technology, Teddington, UK

**Constitutive Models and Their Data Requirements for Use in Finite Element Analysis of Adhesives under Impact Loading, Report No. 2. Project PAJ2: Dynamic Performance of Adhesively Bonded Joints**

Charalambides, M. N., National Physical Lab., UK; Dean, G. D., National Physical Lab., UK; Apr. 1997; 30p; In English  
Report No.(s): PB97-185524; NPL-CMMT(A)-59; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Commercial Finite Element Analysis (FEA) software packages are widely used for stress analysis of adhesive joints. The report is a survey of constitutive models implemented in various FEA packages which are potentially suitable for adhesives under impact loading. Emphasis is given to the elastic-plastic models which take into account the pressure dependence of the plastic deformation. These models should be suitable for simulating behavior of most structural adhesives or adhesives whose operating temperatures are lower than their glass transition temperature. Under impact, the stress/strain distributions in a bonded joint are such that the strain rate in the adhesive is not uniform. Therefore, material models that handle the strain rate dependence of properties are needed. Various extensions of elastic-plastic models to include rate dependent behavior are described. The determination of parameters that define the yield behavior of a material that is sensitive to hydrostatic stress requires tests under at least two different states of stress. In the report, it is shown how data from tensile and shear tests can be analyzed to give these parameters. In the tensile tests, measurements of lateral and longitudinal strain are needed to generate plots of true stress against plastic strain which characterize the hardening behavior. These measurements also allow a value for the flow parameter to be derived. Finally, alternative constitutive models are considered which might be more suitable for simulating the behavior of rubbery adhesives or for adhesives tested at temperatures just above their glass transition temperatures. These are the linear viscoelastic and the non-linear elastic models. The latter are based on large strain constitutive theories developed for rubbers. An option exists where these two models can be used together to describe non-linear, elastic, strain rate dependent behavior.

NTIS

*Impact Loads; Adhesive Bonding; Bonded Joints; Finite Element Method*

**19980004624** NERAC, Inc., Tolland, CT USA

**Recycling of Rubber, Plastics, and Polymeric Materials (Latest citations from the Energy Science and Technology Database)**

Oct. 1996; In English; Page count unavailable

Report No.(s): PB97-850747; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the recycling of plastic scrap and wastes. Articles discuss local and regional programs, production of new end products and novel uses, environmental impacts of recycling plastics and elastomers (rubbers), reuse of auto tires, processing of waste polymers, properties of recycled plastics, economics of plastic recycling, and industry trends. General information on plastic recycling for specific materials can be found in related bibliographies. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Recycling; Plastics; Rubber; Bibliographies; Reclamation; Environment Effects*

**19980004634** NERAC, Inc., Tolland, CT USA

**High Temperature, High Wear Resistant Solid Lubricants (Latest citations from Fluidex)**

Oct. 1996; In English; Page count unavailable

Report No.(s): PB97-850754; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning solid lubricants for high wear and high temperature resistant applications. Emphasis is placed upon molybdenum disulfide, however, gold-molybdenum alloys and polysiloxanes are also discussed. Methods for depositing thin film solid lubricants, including sputtering and electrodeposition are presented. The corrosion properties of the solid lubricant-metal interface are also included. (Contains 50-250 citations and includes a subject term index and title list.)  
NTIS

*Solid Lubricants; Bibliographies*

**19980004640** Cleveland State Univ., Chemical Engineering Dept., Cleveland, OH USA

**Creep of Refractory Fibers and Modeling of Metal and Ceramic Matrix Composite Creep Behavior *Final Report***

Tewari, S.N., Cleveland State Univ., USA; 1995; 11p; In English

Contract(s)/Grant(s): NCC3-119

Report No.(s): NASA/CR-95-206419; NAS 1.26:206419; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our concentration during this research was on the following subprograms. (1) Ultra high vacuum creep tests on 218, ST300 and WHfC tungsten and MoHfC molybdenum alloy wires, temperature range from 1100 K to 1500 K, creep time of 1 to 500 hours. (2) High temperature vacuum tensile tests on 218, ST300 and WHfC tungsten and MoHfC molybdenum alloy wires. (3) Air and vacuum tensile creep tests on polycrystalline and single crystal alumina fibers, such as alumina-mullite Nextel fiber, yttrium aluminum garnet (YAG) and Saphikon, temperature range from 1150 K to 1470 K, creep time of 2 to 200 hours. (4) Microstructural evaluation of crept fibers, TEM study on the crept metal wires, SEM study on the fracture surface of ceramic fibers. (5) Metal Matrix Composite creep models, based on the fiber creep properties and fiber-matrix interface zone formation.

Derived from text

*Creep Tests; Creep Properties; High Vacuum; Wire; Molybdenum Alloys; High Temperature Tests; Tensile Tests; Tensile Creep; Polycrystals; Single Crystals; Ceramic Matrix Composites; Fiber-Matrix Interfaces*

**19980004641** NERAC, Inc., Tolland, CT USA

**Corrosion Prevention: Conversion Coatings and Coating Processes (Latest citations from the US Patent Bibliographic File with Exemplary Claims)**

Oct. 1996; In English; Page count unavailable

Report No.(s): PB97-850630; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning conversion coatings and coating processes for the prevention of metal corrosion in various environments. Conversion coating patents for the application of phosphates and chromates to the surfaces of aluminum, zinc, ferrous metals, titanium, cadmium, iron, steels, and various alloys are presented. Topics include coating compositions, surface preparations and pretreatments prior to coating applications, post-treatment of coated metal surfaces, coating quality control, and sacrificial coatings for jet engines. Specific patents concerning protective coatings are excluded and covered in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Corrosion Prevention; Protective Coatings; Coating*

**19980004664** NERAC, Inc., Tolland, CT USA

**Metallization of Plastics. (Latest Citations from the Ei Compendex\*Plus Database)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-859434.

Report No.(s): PB97-854616; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the metallization of plastics and plastic films using a variety of application techniques. Methods described include vapor deposition, sputtering, and electroless plating. Plastic surface preparation prior to the metallization process is discussed. Metallized plastics for the packaging industry, electromagnetic shielding, and decorative coatings are among the applications included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Metallizing; Plastics*

**19980004678** NERAC, Inc., Tolland, CT USA

**Textured Yarns. (Latest citations from the U.S. Patent Bibliographic File with Exemplary Claims)**

Sep. 1996; In English; Page count unavailable.

Report No.(s): PB96-873666; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning manufacture and preparation of textured yarns. References cite technological innovations for applications, preparation, and raw materials. Also referenced is equipment for manufacturing the yarns or products from the yarns. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Yarns*

**19980004685** National Chemicals Inspectorate, Solna, Sweden

**Additives in PVC. Marking of PVC. Report from a Government Commission *Additiv i PVC; Maerkning av PVC. Rapport av ett Regeringsuppdrag***

Larsson, C., National Chemicals Inspectorate, Sweden; Jun. 1996; 149p; In Swedish

Report No.(s): PB97-127971; KEMI-6-96; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The National Chemicals Inspectorate received a commission from the government to propose measures to minimize risks to health and the environment caused by additives in PVC. The commission also included proposing general guidelines for marking of PVC-products.

NTIS

*Toxicity; Polyvinyl Chloride; Toxic Hazards*

**19980004691** NERAC, Inc., Tolland, CT USA

**Conformal Coatings. (Latest citations from World Surface Coatings Abstracts)**

May 1997; In English; Page count unavailable. Supersedes PB96-862545.

Report No.(s): PB97-860290; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning conformal coatings applied to non-uniform substrates. These substrates are characterized by varied surface contours. Topics include coating applications, rheological properties, and applications methods. Curing procedures, including heat curing and radiation curing, are covered.

NTIS

*Bibliographies; Coating; Contours; Curing*

**19980004705** NERAC, Inc., Tolland, CT USA

**Heat Resistant Plastics Excluding Nitrogen-Containing Compounds. (Latest citations from the NTIS Bibliographic Database)**

May 1997; In English; Page count unavailable. Supersedes PB96-862404.

Report No.(s): PB97-860282; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the synthesis and applications of heat resistant plastics, excluding nitrogen-containing compounds. Topics include physical and chemical properties characterizations, preparation techniques, and degradation analyses in specific atmospheres. Applications include use as sealants and solar collector components.

NTIS

*Bibliographies; Chemical Properties; Thermal Resistance; Plastics; Sealers; Solar Collectors*

**19980004748** Sandia National Labs., Albuquerque, NM USA

**Investigation of effects of deposition parameters on composition, microstructure, and emission of RF sputtered SRS:Eu thin film phosphors**

Droes, S. R., New Mexico Univ., USA; Ruffner, J.A., Sandia National Labs., USA; Mueller-Mach, R., Hewlett-Packard Co., USA; Mueller, G. O., Hewlett-Packard Co., USA; [1996]; 4p; In English; 2nd; International Conference on the Science and Technology of Display Phosphors, 18-20 Nov. 1996, San Diego, CA, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-96-2889C; CONF-9611114-1; DE97-001890; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

There has been little systematic study of the cause of dead (inactive) layers in II-VI phosphors used in thin film electroluminescent devices. This paper discusses preparation and characterization of rf sputter deposited Eu-doped SR sulfide (SRS:Eu) thin films for use in a study to determine the cause of the dead layer. (The dead layer's behavior is likely influenced by thin film composition, crystallinity, and microstructure.) We have deposited SRS:Eu thin films in a repeatable, consistent manner and have characterized properties such as composition, crystallinity, and microstructure as well as photoluminescent (PL) and electroluminescent behavior. The composition was determined using Rutherford backscattering spectrometry and electron microprobe analysis. XRD was used to assess crystalline orientation and grain size, SEM to image thin film microstructure. Measuring the PL decay after subnanosecond laser excitation in the lowest absorption band of the dopant allowed direct measurement of the dopant luminescence efficiency.

DOE

*Absorption Spectra; Backscattering; Crystallinity; Doped Crystals; Electroluminescence; Microstructure; Phosphors; Scanning Electron Microscopy; Sulfides; Thin Films*

**19980004786** NERAC, Inc., Tolland, CT USA

**Tetrafluoroethylene (Teflon) Polymerization: Chemical Analysis. (Latest citations from the Rubber and Plastics Research Association Database)**

May 1997; In English; Page count unavailable. Supersedes PB96-862909.

Report No.(s): PB97-860407; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the polymerization of tetrafluoroethylene. Copolymerization, radiation induced grafting, molecular structure, viscoelasticity, thermal characteristics, and low temperature polymerization are among the topics discussed. Applications of tetrafluoroethylene polymers in protective films, membranes, and bearings are briefly considered.

NTIS

*Teflon (Trademark); Copolymerization; Chemical Analysis; Bibliographies; Polymerization; Rubber; Plastics*

**19980004789** NERAC, Inc., Tolland, CT USA

**Acrylic Resins. Acrylamides: Latest citations from the Ei Compendex\*Plus Database**

May 1997; In English; Page count unavailable, Supersedes PB96-861489.

Report No.(s): PB97-860043; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the chemistry and applications of acrylamide resins. Polymerization, grafting, molecular structure, kinetics, and copolymerization are discussed. Applications are described, and physical and chemical properties are considered briefly. Other acrylic resins are discussed in separate bibliographies.

NTIS

*Bibliographies; Acrylic Resins; Polymerization; Copolymerization; Chemical Properties; Molecular Structure*

**19980004812** NERAC, Inc., Tolland, CT USA

**Diamond Films. (Latest citations from the U.S. Patent Bibliographic File with Exemplary Claims)**

Sep. 1996; In English; Page count unavailable.

Report No.(s): PB96-873682; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the manufacture of diamond layers, films, composites, and laminates. Chemical vapor deposition of diamond structures on a variety of substrates is described. Applications include flat-panel display systems, heat dissipating devices, cutting tools, thermal sensor/heaters, and thermistors. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Diamond Films; Thin Films*



**19980004813** NERAC, Inc., Tolland, CT USA

**Plastics Decomposition: Thermal Degradation Analytical Techniques and Byproducts. (Latest citations from the Ei Compendex\*Plus Database)**

May 1997; In English; Page count unavailable. Supersedes PB96-862339.

Report No.(s): PB97-860258; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the studies of thermal polymer degradation and decomposition. References to calorimetric, spectroscopic, thermogravimetric, chromatographic, and infrared analyses are presented. Properties of byproducts, characterization of plastics degradation, and decomposition dynamics are discussed. Thermal degradation mechanisms and processes, and photodegradation are discussed in separate bibliographies.

NTIS

*Thermal Degradation; Chromatography; By-Products; Photodecomposition; Thermogravimetry; Infrared Radiation; Bibliographies*

**19980004816** NERAC, Inc., Tolland, CT USA

**Polyimide Adhesives: Latest citations from the US Patent Bibliographic File with Exemplary Claims**

Jun. 1996; In English; Page count unavailable, Supersedes PB95-853867.

Report No.(s): PB96-871298; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the use of polyimide resins for adhesive bonding. The design and preparation methods of adhesive polyimide films, layers, strips, and powders are presented. References cover polyimide-based heat resistant adhesives and coatings, polyimide/copper laminates, semi-interpenetrating polyimides, and acetylene endcapped polyimides. Applications in the manufacture and packaging of semiconductor devices, integrated circuits, and circuit boards are included.

NTIS

*Polyimides; Bibliographies; Adhesive Bonding; Polyimide Resins; Powder (Particles); Thermal Resistance; Semiconductor Devices*

**19980004818** NERAC, Inc., Tolland, CT USA

**Cement and Concrete. Polymer Coatings: Latest citations from the Rubber and Plastics Research Association Database**

Jun. 1996; In English; Page count unavailable, Supersedes PB95-866661.

Report No.(s): PB96-871108; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning polymeric coatings used in concretes and cements. References examine water-based and water-dispersible coatings with high reactivity, low viscosity, water and solvent resistance, toughness, and durability. Coating materials include polyurethanes, methacrylates, epoxy resin, vinyls, butyl rubber, and PVC copolymers.

NTIS

*Bibliographies; Plastic Coatings; Cements; Concretes; Toughness; Durability; Polymeric Films*

**19980004823** NERAC, Inc., Tolland, CT USA

**Conductive Plastics for Electromagnetic Shielding. (Latest citations from Engineered Materials Abstracts)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-854526.

Report No.(s): PB97-851679; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning shielding of electrical devices with electrically conductive plastics to prevent interference from radiofrequency electromagnetic waves. Citations discuss applications in spacecraft, computer equipment, and office equipment. Conductive plastics include those filled with metal particles, metal fibers, or carbon black. Inherently conductive polymers are discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Plastics; Electromagnetic Shielding; Bibliographies*

**19980004917** Michigan Univ., Dept. of Materials Science and Engineering, Ann Arbor, MI USA

**Free Form Fabrication of Ceramics by Stereolithography Final Report, 1 Jan. 1993 - 31 Dec. 1994**

Halloran, John W., Michigan Univ., USA; Aug. 25, 1997; 41p; In English

Contract(s)/Grant(s): N00014-93-I-0302

Report No.(s): AD-A329897; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During this grant we showed that stereolithography can directly fabricate ceramic green bodies from ultraviolet (UV) curable solutions which contain dispersed ceramic powders. We demonstrated SLA of silica, a model refractory for metal casting molds, and SLA of alumina, which is promising for structural ceramics. Viscosity control for these highly concentrated suspensions and cure depth behavior were the main issues for fabricating a ceramic using stereolithography techniques. These ceramic SLA suspensions were evaluated in a stereolithography machine, and three-dimensional parts were built. Part building parameters, Dp and Ec, were determined for this suspension. Layer adhesion and subsequent processing resulted in good ceramic parts.

DTIC

*Aluminum Oxides; Fabrication; Lithography; Powder (Particles); Refractory Metals; Silicon Dioxide*

**19980005006** NERAC, Inc., Tolland, CT USA

**Etching Silicon. (Latest citations from the U.S. Patent Bibliographic File with Exemplary Claims)**

Oct. 1996; In English; Page count unavailable.

Report No.(s): PB97-850119; Copyright Waived; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning methods and processes of etching silicon and silicon compound layers, films, and structures. Etching techniques are presented for use in the manufacture of semiconductor devices, integrated circuit structures, light emitting diode arrays, capacitors, sensors, and memory devices. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Etching; Silicon Compounds*

**19980005010** Lehigh Univ., Whitaker Lab., Bethlehem, PA USA

**Tailoring of Grain Boundary Chemistry for the Development of Highly Creep Resistant Alumina Final Report, 1 Jun. 1994 - 31 May 1997**

Harmer, M. P., Lehigh Univ., USA; Chan, H. M., Lehigh Univ., USA; Rickman, J., Lehigh Univ., USA; Bruley, J., Lehigh Univ., USA; Cho, J., Lehigh Univ., USA; Aug. 29, 1997; 151p; In English

Contract(s)/Grant(s): F49620-94-I-0284

Report No.(s): AD-A330476; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Research has demonstrated that the controlled doping of ultra-high purity alumina with small amounts (less than 1000 ppm) of rare earth elements, such as La and Y, dramatically lowers the sintering and creep rate. Due to the large ionic radius of the rare earth elements, rare earth elements have a low solubility in alumina and segregate strongly to the grain boundaries. Chemical composition (STEM) profiles indicate that segregation of Y and La is localized to within about 2 nm of the grain boundary i.e. about a single unit cells width. The concentration is about 9 atom % within 1 run of the boundary. It is hypothesized that grain boundary segregation plays a key role in slowing down grain boundary diffusion and creep. Atomistic computer simulation has been utilized to predict the distribution of point defects and dopants near grain boundaries and free surfaces and will eventually permit a determination of the boundary diffusivity along segregated boundaries. Selective co-doping with 100 ppm Zr and 100 ppm Nd has been found to produce the largest reduction in creep rate, of about a factor 500. The creep kinetics suggest that, in the Nd/Zr co-doped alumina, grain boundary diffusion has been suppressed to such degree that lattice diffusion is rate controlling.

DTIC

*Aluminum Oxides; Creep Strength; Doped Crystals; Computerized Simulation; Grain Boundaries*

**19980005011** University of Southern California, Dept. of Engineering/Electro-Physics, Los Angeles, CA USA

**Integrated Polymer-Semiconductor Opto-Electronics: Basic Materials Studies Final Report, 14 Jun. 1994 - 14 Jun. 1997**

Steier, William, University of Southern California, USA; Sep. 01, 1997; 26p; In English

Contract(s)/Grant(s): F49620-94-I-0323; AF Proj. 1651

Report No.(s): AD-A329753; AFOSR-TR-97-0407; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this research is to bring the demonstrated advantages of the electrooptic polymers into use in photonic devices and systems. In this report we demonstrate a waveguide taper section for improved mode matching between the traveling wave electrooptic polymer modulator and input and output fibers. The taper section increases the waveguide mode and reduces the fiber coupling loss at each end by approximately 2 dB. The design is compatible with current modulator design. We also report

on a polymer bleaching process for balancing the outputs of a waveguide Y junction. This process is used to increase the extinction ratio of a polymer Mach Zehnder modulator.

DTIC

*Losses; Mach Number; Modulators; Semiconductors (Materials); Tapering; Waveguides*

**19980005015** Ohio State Univ., Dept. of Physics, Columbus, OH USA

**Electronic Structure of Pyridine-Based Polymers**

Blatchford, J. W., Ohio State Univ., USA; Gustafson, T. L., Ohio State Univ., USA; Epstein, A. J., Ohio State Univ., USA; Sep. 20, 1997; 49p; In English

Contract(s)/Grant(s): N00014-95-I-0302

Report No.(s): AD-A330129; TR-P276; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We present the results of semiempirical quantum chemical calculations on oligomers of poly (p-pyridyl vinylene) (PPyV) and poly (p-pyridine) (PPy). The presence of a nitrogen heteroatom in the conjugated backbone of these polymers presents a severe breaking of both spatial and charge conjugation symmetry (CCS), and the addition of nonbonding (n) orbitals has potentially major effects on the photophysics of these systems. Geometries are optimized at the PM3 Hartree-Fock level for neutral, singly charged and doubly charged oligomers. We find that the geometric distortions associated with polaron formation are centered on the vinylene linkages in PPyV-based systems and on the interring bonds in the ppy-based systems. We discuss the electronic structure at the PM3 level applying configuration interaction between singly excited states (SCI), and we demonstrate that the lowest-lying (n approaches  $\pi^*$ ) states of the ideal polymer chain are well above the lowest states, predicting strong fluorescence in these systems. Deviations from ideal geometry, however, can lead to substantial mixing of the manifolds, thereby altering this conclusion. We calculate absorption spectra for neutral, singly charged (polaron) doubly charged (bi-polaron) and triplet state oligomers using the INDO/SCI technique. For PPyV comparison of oligomers with differing spatial symmetry allows the isolation of the effects of CCS breaking. All calculated spectra are in good agreement with experimental results and indicate that the symmetry breaking due to the nitrogen heteroatom is weak.

DTIC

*Absorption Spectra; Atomic Energy Levels; Atomic Structure; Bonding; Broken Symmetry; Configuration Interaction; Conjugation; Fluorescence*

**19980005103** Oak Ridge National Lab., TN USA

**Ferromagnetic nanocomposite films from thermally labile nitride precursors**

Maya, L., Oak Ridge National Lab., USA; Paranthaman, M., Oak Ridge National Lab., USA; Thompson, J. R., Oak Ridge National Lab., USA; Thundat, T., Oak Ridge National Lab., USA; Stevenson, R.J., Oak Ridge K-25 Site, USA; [1996]; 9p; In English; Fall Meeting of the Materials Research Society (Mrs), 2-6 Dec. 1996, Boston, MA, USA

Contract(s)/Grant(s): DE-AC05-96OR-22464

Report No.(s): CONF-961202-20; DE97-001307; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A series of nanocomposite films containing Ni or Co nitride dispersed in a ceramic matrix of Al nitride, B nitride, or SiO<sub>2</sub> nitride, were prepared by reactive sputtering of selected alloys or compounds such as Ni aluminide or Co silicide. Thermal treatment of the nitride composites in vacuum at (1e)500 C leads to selective loss of N from CoN or Ni(sub 3)N to generate dispersions of the metal in the ceramic matrix. This treatment may be performed in a localized manner by means of a focused laser beam to generate microscopic features that are imaged by magnetic force microscopy. The films are potentially useful for data storage with superior chemical and mechanical stability provided by the ceramic matrix and high encoding density made possible because of the size of the magnetic particles of less than 10 nm generated in the thermal treatment. The films were characterized by chemical and physical means including FTIR, TEM, MFM, and magnetic measurements. Preliminary results on similar iron composites are also described.

DOE

*Ceramic Matrix Composites; Ferromagnetic Films; Infrared Spectra; Magnetic Measurement; Microscopy; Nitrides; Reactivity; Silicides; Sputtering*

**19980005125** Michigan Univ., Dept. of Materials Science and Engineering, Ann Arbor, MI USA

**Tough Ceramics from Fibrous Monoliths Final Report, 1 Apr. 1991 - 30 Mar. 1993**

Halloran, John W., Michigan Univ., USA; Aug. 25, 1997; 66p; In English

Contract(s)/Grant(s): N00014-91-J-1999

Report No.(s): AD-A329890; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

During this 1991-1993 grant, the University of Michigan developed "fibrous monolithic ceramics", a new class of monolithic ceramics with properties comparable to ceramic fiber reinforced ceramic matrix composites CMC's. They consist of a 250-micron "cells" of a strong polycrystalline ceramic, such as silicon carbide or silicon nitride, separated by cell boundaries" from materials, such as boron nitride, which promote crack deflection and delamination. These materials show graceful failure in flexure, with strengths around 350 MPa and work of fracture around 2000 J/m<sup>2</sup>. Fibrous monolithic ceramics are made from conventional low-cost ceramic powder, using extrusion methods common in conventional ceramic manufacture. We have demonstrated successful fibrous monoliths with silicon carbide, silicon nitride, and alumina, using weak interfaces of graphite or boron nitride. The boron nitride systems are resistant to oxidation. Their room temperature properties are unaffected by exposure at 1400 deg C.

DTIC

*Aluminum Oxides; Boron Nitrides; Ceramic Fibers; Ceramic Matrix Composites; Ceramics; Cracks; Deflection; Delaminating; Exposure; Extruding; Fiber Composites; Flexing; Fracturing; Graphite*

**19980005139** Ohio State Univ., Dept. of Physics, Columbus, OH USA

**Conducting Polymers: Electrical Conductivity**

Kohlman, R. S., Ohio State Univ., USA; Joo, J., Ohio State Univ., USA; Epstein, A. J., Ohio State Univ., USA; Sep. 20, 1997; 97p; In English

Contract(s)/Grant(s): N00014-95-I-0302

Report No.(s): AD-A330245; TR-P251; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

While undoped polymers are insulators, doped conducting polymers have conductivities comparable to conventional metals and semiconductors despite their polymer chain structure. Models for the doping induced insulator-metal transition and the metallic conductivity of conducting polymers are introduced. The electrical charge transport data including DC conductivity, magnetoresistance, thermoelectric power, and microwave and optical dielectric constant of a wide range of conducting polymer materials are reviewed. A summary of the structural order and the density of states at the Fermi level of conducting polymers is also presented. The metallic properties of conducting polymers are a function of the structural order of the polymers.

DTIC

*Conducting Polymers; Conductivity; Doped Crystals; Electric Charge; Electrical Resistivity; Magnetoresistivity; Thermoelectricity*

**19980005215** NERAC, Inc., Tolland, CT USA

**Injection Molding of Fiber Reinforced Thermoplastics: Latest citations from the Rubber and Plastics Research Association Database**

May 1997; In English; Page count unavailable, PB96-861471.

Report No.(s): PB97-860035; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning injection molding of fiber reinforced thermoplastics. Glass, aramid, carbon-carbon, Kevlar, and graphite fibers and fillers are used in these processes. Applications include the formation of automotive parts, engine parts, and parts for the aerospace industry. Methods of testing finished parts are briefly discussed.

NTIS

*Bibliographies; Injection Molding; Thermoplastic Resins; Reinforced Plastics; Fiber Composites; Reinforcing Fibers*

**19980005256** Purdue Univ., Dept. of Transportation, West Lafayette, IN USA

**Use of Pyrolyzed Carbon Black as an Additive, Part 3, Air-Cooled Furnace Slag Final Report**

Lee, K. H., Purdue Univ., USA; Lovell, C. W., Purdue Univ., USA; Salgado, R., Purdue Univ., USA; Nov. 20, 1996; 210p; In English

Report No.(s): PB97-161640; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Scrap tires, generated at the rate of over 242 million each year in the USA, are recognized as one of the most significant environmental problems. Most of these scrap tires have been disposed of in landfills, stockpiles, and illegal dumps (EPA 1991). There is a need to find more useful, environmentally friendly applications for these tires. Extensive researches have been conducted in the past years on the utilization of the scrap tires. The use of scrap tires for asphalt pavement, which is complicated by the complex behavior of asphalt, has received major attention. This research aims to describe the performance of mixtures of asphalt using pyrolyzed carbon black as an additive.

NTIS

*Pavements; Pyrolysis; Scrap; Stockpiling*

**19980005260** California Univ., Dept. of Chemical, Biochemical Engineering and Materials Science, Irvine, CA USA

**Spray Processing and Mechanical Behavior of Gamma-TiAl Final Report, 1 Mar. 1994 - 28 Feb. 1997**

Lavernia, Enrique J., California Univ., USA; Earthman, James C., California Univ., USA; May 20, 1997; 106p; In English  
Contract(s)/Grant(s): F49620-94-I-0137

Report No.(s): AD-A329906; AFOSR-TR-97-0360; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The principal developments during the three-year contract period may be described as follows: design and successful implementation of spray forming experiments using gamma-TiAl alloys; microstructural characterization and mechanical testing on spray formed gamma-TiAl alloys; two dimensional modeling of momentum and thermal behavior during spray atomization of gamma-TiAl; investigation of thermal residual stresses in spray formed gamma-TiAl using finite element methods; and finite element simulation of creep deformation and rupture of titanium aluminides.

DTIC

*Titanium Aluminides; Spraying; Forming Techniques*

**19980005274** NERAC, Inc., Tolland, CT USA

**Adhesives for Surface Mounted Devices. (Latest citations from the Ei Compendex\*Plus Database)**

Feb. 1997; In English; Page count unavailable. Supersedes PB96-851225

Report No.(s): PB97-856017; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the mounting of semiconductor devices, integrated circuits, and other electronic components to circuit boards using adhesives. Selecting the proper adhesive, microelectronic assembly and assembly mechanisms, and thermal and electrical properties adhesives used to replace solder are discussed.

NTIS

*Adhesives; Bibliographies; Integrated Circuits; Semiconductor Devices; Solders; Thermodynamic Properties*

**19980005326** NERAC, Inc., Tolland, CT USA

**Polymer Radiation Curing: Siloxanes, Epoxy Resins, and Phenolic Resins (Latest citations from the Energy Science and Technology Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870704; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning techniques and effects of radiation curing on siloxanes, epoxy resins, and phenolic resins. Citations discuss electron beam, ultraviolet radiation, gamma ray, and infrared curing processes and equipment. Curing effects on physical and chemical properties are examined. The use of palm oils for the synthesis of curable resins is presented.

NTIS

*Bibliographies; Epoxy Resins; Phenolic Resins; Silicone Resins; Curing; Radiation Effects; Siloxanes; Ultraviolet Radiation; Phenol Formaldehyde*

**19980005329** Idaho Univ., Dept. of Chemistry, Moscow, ID USA

**Polymer Standards for Testing Fourier Transform Infrared Spectrometers Final Report, Mar. 1996 - May 1997**

Griffiths, Peter R., Idaho Univ., USA; Merklin, Gregory T., Idaho Univ., USA; Bowie, Bryan T., Idaho Univ., USA; Sep. 1997; 37p; In English

Contract(s)/Grant(s): DAAD05-96-P-2192

Report No.(s): AD-A330563; ERDEC-CR-235; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The use of commercially available stress relieved and extruded isotactic Poly-Propylene (iPP) samples was evaluated as a potential photometric standard for Fourier Transform InfraRed (FT-IR) spectrometers. The parameters of polymer film dichroism, temperature sensitivity, sample thickness, and sample positioning were investigated as a function of spectral band position, width, and absorbance. The spectral band at 841 wavenumbers for iPP exhibited a Lorentzian band shape at spectral resolutions of 4 reciprocal centimeters or higher. This band allowed an experimental determination of spectrometer resolution at 4 reciprocal wavenumbers or lower with the iPP samples. The iPP samples also permitted evaluation of the spectrometer responsivity (i.e., band height and position) once the iPP film spectra were assessed as a function of polymer sample temperature.

DTIC

*Standards; Specifications; Stress Relieving; Polypropylene; Evaluation*



**19980005332** NERAC, Inc., Tolland, CT USA

**Automobile Coatings: Polyurethanes (Latest citations from World Surface Coatings Abstracts)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870068; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning polyurethane coatings used in automobile finishes. The citations include compositions of the coatings, with references to curing accelerators, stabilizers, catalysts, color matching, and painting techniques. Painting techniques include spraying and electrocoating, with a few references to robotic painting because of health considerations.

NTIS

*Bibliographies; Protective Coatings; Technologies; Catalysts; Finishes; Spraying*

**19980005347** Materials Research Society, Pittsburgh, PA USA

**Structure and Dynamics of Glasses and Glass Formers**

Angell, C. A., Editor, Arizona State Univ., USA; Ngai, K. L., Editor, Naval Research Lab., USA; Kieffer, J., Editor, Illinois Univ., USA; Egami, T., Editor, Pennsylvania Univ., USA; Nienhaus, G. U., Editor, Ulm Univ., Germany; Dec. 1996; 507p; In English; Structure and Dynamics of Glasses and Glass Formers, 2-6 Dec. 1996, Boston, MA, USA

Contract(s)/Grant(s): DAAG55-97-I-0005

Report No.(s): AD-A329551; ISBN 1-55899-359-2; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This report contains proceedings from the Structure and Dynamics of Glasses and Glass Formers held 2-6 Dec 96. Groups of topics include: (1) short time dynamics, (2) relaxation dynamics of glasses and glass formers, (3) glasslike systems, simulations, and models, (4) contrasting metallic, ionic, bio, and polymer systems, (5) structure, energetics, and polymorphism, and (6) structure and dynamics of glasses and glass formers.

DTIC

*Porous Materials; Silica Glass; Conferences*

**19980005349** NERAC, Inc., Tolland, CT USA

**Poly Tetrafluoroethylene (Teflon) (Latest citations from the NTIS Bibliographic Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870043; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning government sponsored research reports on tetrafluoroethylene, including its reactions, properties, performance, evaluation, and manufacturing.

NTIS

*Bibliographies; Teflon (Trademark); Dynamic Characteristics; Evaluation; Manufacturing*

**19980005361** NERAC, Inc., Tolland, CT USA

**Polycarbonates: Optical Properties and Applications (Latest citations from the Rubber and Plastics Research Association Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870092; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning research studies, designs, and applications of polycarbonates relative to optical properties. Among the applications discussed are light-emitting diode digital display components, field glass eye pieces, photo lenses, window shields, solar panels, and automotive lighting systems. Performance evaluations and property examinations are also included.

NTIS

*Bibliographies; Optical Properties; Light Emitting Diodes; Display Devices; Eye (Anatomy); Solar Cells; Optical Materials*

**19980005363** Ohio State Univ., Dept. of Physics, Columbus, OH USA

**Low Energy Photophysics of Phenylene-Based Strapped Copolymers**

Epstein, A. J., Ohio State Univ., USA; Piskun, N. V., Ohio State Univ., USA; Lebedenko, I. V., Ohio State Univ., USA; Jessen, S. W., Ohio State Univ., USA; Gustafson, T. L., Ohio State Univ., USA; Sep. 20, 1997; 10p; In English

Contract(s)/Grant(s): N00014-95-I-0302

Report No.(s): AD-A330241; TR-P318; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

We present the absorption and emission properties of the phenylene-based copolymers, poly (pyridyl vinylene-phenylene vinylene) (PPyVPV), poly (thienylene p-phenylene) (PTpP) and poly (dithienylene p-phenylene) (PDTpP), which incorporate 'Straps' to bridge the 2 and 5 positions of the phenyl rings. The absorption and luminescence properties of the PPyVPV polymers are morphology dependent. The absorption's maxima are at -3.0 eV, with the films having absorption edges that tail into the IR. The photoluminescence (PL) spectra are red shifted for films compared to solutions and powders, with the presence of smaller red shifted photoluminescence for the PPyVPV polymers with straps. A low-lying absorption maximum occurs at 2.7 eV for both solution and film forms of PTpP. The (PL) spectra also are similar with features at 2.1 eV and 2.3 eV assigned to the 0-1 and 0-0 vibronic transitions, respectively. Solution and film photoluminescence excitation (PLE) profiles qualitatively follow the absorption spectra. Two low energy absorption maxima are seen for PDTpP at 2.8 eV and 3.2 eV with a single feature observed at 2.3 eV for the PL. The PLE spectra in PDTpP also follow the corresponding absorption features in both solution and film samples. The resolved PL studies (ps to ns) show that there is smaller spectral shift for the films of polymers with straps, showing the importance of reduced aggregation. Steady state photoinduced absorption studies (ms) indicate the roles of both polarons and triplet excitons in these systems.

DTIC

*Phenyls; Copolymers; Absorption Spectra; Emission Spectra*

**19980005364** Ohio State Univ., Dept. of Physics, Columbus, OH USA

**Charge Transport of the Mesoscopic Metallic State in Partially Crystalline Polyanilines**

Joo, J., Ohio State Univ., USA; Long, S. M., Ohio State Univ., USA; Pouget, J. P., Ohio State Univ., USA; Oh, E. J., Ohio State Univ., USA; MacDiarmid, A. G., Ohio State Univ., USA; Sep. 20, 1997; 40p; In English

Contract(s)/Grant(s): N00014-95-I-0302; N00014-92-J-1369

Report No.(s): AD-A330217; TR-P311; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The charge transport properties including temperature dependent dc conductivity, thermoelectric power, electron paramagnetic resonance, microwave frequency dielectric constant and conductivity, and electric field dependent conductivity of partially crystalline ('physically' crosslinked) polyaniline correlated with x-ray structure studies demonstrate that charge delocalization in physically crosslinked polyaniline systems is structurally controlled. Further, we observe a positive dielectric constant at room temperature which increases (to values greater than or equal  $10(\exp 4)$ ) with increasing percent crystallinity, size of crystalline regions and polymer chain alignment in the disordered regions supporting the establishment of mesoscopic metallic regions. We propose an inhomogeneous disorder model for this system in which ordered (crystalline) regions, described by three-dimensional metallic states are connected through amorphous regions of polymer chains where one-dimensional disorder-induced localization is dominant. We utilize the metallic box, interrupted metal strands, and Nakhmedov's phonon induced delocalization models to account for the temperature dependence of charge transport properties of the various partially crystalline polyanilines. Novel analyses for the sample and temperature dependent electron paramagnetic resonance linewidth and thermoelectric power are presented.

DTIC

*Crystallinity; Charge Transfer; Transport Properties; Permittivity; Order-Disorder Transformations*

**19980005374** Oak Ridge National Lab., TN USA

**Laser induced fluorescence imaging of thermal damage in polymer matrix composites**

Wachter, E. A., Oak Ridge National Lab., USA; Fisher, W. G., Oak Ridge National Lab., USA; Meyer, K. E., Oak Ridge National Lab., USA; [1996]; 10p; In English; 2nd; Conference on Nondestructive Evaluation Applied to Process Control of Composite Fabrication, 1-2 Oct. 1996, St. Louis, MO, USA

Contract(s)/Grant(s): DE-AC05-96OR-22464

Report No.(s): CONF-9610100-1; DE97-001037; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A simple, fluorescence-based imaging system was developed for identifying regions of thermal damage in polymer-matrix composites (PMCs). PMCs have important applications where low weight and high mechanical strength are needed. One concern in the aerospace industry is the tendency of some PMC materials to become irreversibly damaged when exposed to high temperatures. Traditional nondestructive evaluation (NDE) techniques are capable of detecting physical flaws, such as cracks and delaminations, but have not proven effective for detecting initial heat damage, which occurs on a molecular scale. Spectroscopic

techniques such as laser-induced fluorescence provide an attractive means for detecting thermal damage on large, irregularly shaped surfaces. This paper describes instrumentation capable of rapidly detecting thermal damage in graphite/epoxy components.

DOE

*Composite Materials; Damage; Fluorescence; Graphite-Epoxy Composites; Polymer Matrix Composites; Laser Induced Fluorescence; Nondestructive Tests; Delaminating*

**19980005396** NERAC, Inc., Tolland, CT USA

**Cement and Concrete: Protective Coatings and Treatments. (Latest Citations from World Surface Coatings Abstracts)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-861836

Report No.(s): PB97-854921; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning decorative and protective coatings applied to cements and concretes. The citations examine coatings that provide waterproofing, and resistance to corrosion, mechanical shocks, and cracks. Citations of selected patents are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Protective Coatings; Cements; Concretes*

**19980005398** NERAC, Inc., Tolland, CT USA

**Polymer Blends: Polyolefins (Latest citations from Engineered Materials Abstracts)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870100; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning preparation of polyolefin-based polymer blends. Formulation, morphology, and material properties are discussed. The citations examine a variety of blends, including polyolefin/styrene, olefin/polyamide, alpha-olefin/polyester, and polyolefin/high-nitrile polymer combinations. Specific polyethylene-based polymer blends and specific polypropylene-based polymer blends are discussed in separate bibliographies.

NTIS

*Bibliographies; Chemical Properties; Mechanical Properties; Morphology; Styrenes; Polyesters; Nitriles*

**19980005600** NERAC, Inc., Tolland, CT USA

**Tetrafluoroethylene (Teflon) Polymers: Processing and Production (Latest citations from the US Patent Bibliographic File with Exemplary Claims)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-869938; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the processes used in the polymerization of tetrafluoroethylene. Processes used in the production of membranes, films, foams, and powders made of tetrafluoroethylene are described. Preparation of aqueous solutions containing teflon compounds are included. Selected patents of items containing tetrafluoroethylene are briefly considered.

NTIS

*Polymerization; Bibliographies; Teflon (Trademark); Technologies; Product Development*

**19980005601** NERAC, Inc., Tolland, CT USA

**Ultra-High Molecular Weight Polymers (Latest citations from the Ei Compendex\*Plus Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-869920; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the production, properties, and applications of Ultra-High Molecular Weight (UHMW) polymer materials, with emphasis on polyethylenes. Additives and modifiers used to enhance physical and chemical properties, and testing techniques are discussed. Applications include use in surgical implants and prosthetic devices. Effects of molecular weight on the properties and structural characteristics of ultra-high modulus polyethylenes are also discussed.

NTIS

*Bibliographies; Chemical Properties; Molecular Structure; Molecular Weight; Product Development*

**19980005602** NERAC, Inc., Tolland, CT USA

**Polyvinyl Chloride (Latest citations from the NTIS Bibliographic Database)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-869896; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning preparation, properties, composition, toxicity, and health hazards of polyvinyl chloride. Topics include aging tests, combustion products, occupational safety and health, photolysis, thermal degradation, and pollution.

NTIS

*Bibliographies; Polyvinyl Chloride; Dielectric Properties; Dynamic Characteristics; Mechanical Properties; Health; Hazards*

**19980005603** NERAC, Inc., Tolland, CT USA

**Adhesive Bonding of Fabrics (Excluding Nonwoven Materials) (Latest citations from World Textile Abstracts)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-869862; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the adhesive bonding of fabric to itself and to other substrates. The citations examine bonding techniques and equipment, processes, and materials. Applications for flocked fasteners, wall coverings, upholstered fabric, and carpets are discussed.

NTIS

*Bibliographies; Adhesive Bonding; Textiles; Fabrics*

**19980005616** National Defence Research Establishment, Avdelningen foer Styrning, Material och, Stockholm, Sweden

**Fibre/Matrix Interaction Studied by Single-Fibre Fragmentation Tests *Studie av Vaexelverkan Mellan Fiber och Matrix med Hjaelp av Fragmenteringsprov pa Enkelfiber***

Hansson, W., National Defence Research Establishment, Sweden; Mar. 1996; 32p; In Swedish; Figures in this document may not be legible in microfiche

Report No.(s): PB97-101877; FOA-R-96-00239-2.5-SE; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The study has been performed to facilitate the decision regarding the components in the composite to be used for the YS2000 hull. For environmental reasons the epoxy matrix is preferably replaced by a polyester or vinylester. The fiber/matrix adhesion in some potential combinations has been studied by single-fiber fragmentation tests. Reference materials with epoxy as well as E-glass/polyester have been used. Toray T700/polyester, T700/vinylester and T300 (size 4, for epoxy)/polyester test specimens gave fiber fragmentation with pull-out, but no microcracks in the matrix or debonding. With Tenax-UTS/vinylester no fiber fracture appeared, just a large pull-out where the test specimens failed. In the T300 (size 5, for polyester)/polyester, the fiber fragmentation caused cup-cone and disk shaped microcracks in the matrix. T700/epoxy acted the same way, but a distinct debonding was also observed. Finally, in the E-glass/vinylester specimens debonding occurred by fiber fragmentation.

NTIS

*Fragmentation; Adhesion; Hulls (Structures); Fiber-Matrix Interfaces; Polyether Resins; Debonding (Materials); Fiber Composites; Fracturing*

**19980005619** National Defence Research Establishment, Avdelningen foer Styrning, Material och, Stockholm, Sweden

**Controllable Materials: Conducting Polymers in Radar Absorbing Composites *Styrbara Material: Ledande Polymerer i Radarabsorberande Kompositer***

Dickman, O., National Defence Research Establishment, Sweden; Larsson, F., National Defence Research Establishment, Sweden; Lindersson, K., National Defence Research Establishment, Sweden; Ousbaeck, J. O., National Defence Research Establishment, Sweden; Wernlund, L. D., National Defence Research Establishment, Sweden; Feb. 1996; 19p; In Swedish

Report No.(s): PB97-101034; FOA-R-96-00231-2.4-SE; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The conductivity of some polymers can be varied with the concentration of doping molecules. This makes it possible to develop dynamically adaptive radar absorbing materials. In the literature (UK, USA) results have been published which indicate that this has been done, but there is no specification of how the material was produced. In this report we have studied the possibilities to embed a commercially available intrinsically conducting polymer (polypyrrole) in a composite material and characterized the electrical properties of the material. A model for calculation of radar absorptance was developed and results agreeing with

results from the literature were obtained. by varying one of the parameters in the model the radar absorptance was varied. The conductivity of the polypyrrole (PPy) was unaffected by embedding in a thermoset matrix with low curing temperature. The matrix will protect PPy from oxygen and moisture and the composite could be bent and twisted without affecting the conductivity.

NTIS

*Composite Materials; Antiradar Coatings; Fabrication; Polypyrroles; Electrical Resistivity; Conducting Polymers*

**19980005624** NERAC, Inc., Tolland, CT USA

**Light-Emitting Porous Silicon. (Latest citations from the INSPEC Database)**

Dec. 1996; In English; Page count unavailable.

Report No.(s): PB97-852883; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning light-emitting porous silicon (PS) materials and devices. References discuss silicon porosity, PS layers and films, light-emitting structures and mechanisms, analysis and stability of PS devices, and qualities of the emitted light. PS-based optoelectronics, photonic devices, microphotonics, and optical resonators are reviewed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Porous Silicon; Emittance; Semiconductor Devices*

**19980005634** Environmental Protection Agency, Emission Standards Div., Research Triangle Park, NC USA

**Flexible Polyurethane Foam Emission Reduction Technologies Cost Analysis**

Sep. 1996; 86p; In English; See also PB95-220612.

Report No.(s): PB97-165849; EPA/453/R-95/011; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This document describes the costs of hazardous air pollutant (HAP) emission reduction technologies for flexible polyurethane foam production facilities. Chapter 2 provides background on the industry. Chapter 3 describes the development of 'representative' molded and slabstock facilities, and the calculation of representative facility costs. Chapters 4 and 5 provide brief descriptions for each technology, along with costs for the representative facilities. Chapter 6 summarizes the analysis.

NTIS

*Cost Analysis; Standards; Polyurethane Resins; Air Pollution*

**19980005714** NERAC, Inc., Tolland, CT USA

**Ultraviolet Curing of Polymer Coatings (Latest citations from World Surface Coatings Abstracts)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870530; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the methods and evaluation of ultraviolet curing of polymer coatings. Citations discuss curable protective, decorative, and optical-fiber coatings. Topics include curing photoinitiators, curable coating compositions, properties and stabilization of cured coatings, and coating binders. Cured materials for use in electronics, packaging, recording, automotive parts, and furniture are examined.

NTIS

*Bibliographies; Ultraviolet Radiation; Curing; Technologies; Evaluation; Coatings; Copolymers*

**19980005719** NERAC, Inc., Tolland, CT USA

**Polymer Radiation Curing: Polyester Resins (Latest citations from the US Patent Bibliographic File with Exemplary Claims)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870449; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the methods and processes of radiation curing of polyester resins. Electron beam and ultraviolet radiation curing techniques are presented. Cured materials for use in coatings, paints, adhesives, inks, lacquers, laminates, and photoresists are described.

NTIS

*Bibliographies; Polyester Resins; Electron Beams; Ultraviolet Radiation; Electromagnetic Radiation; Technologies; Curing*



**19980005852** Army Construction Engineering Research Lab., Champaign, IL USA

**Evaluation of Coating Systems for Nonferrous Metal Surfaces *Final Report***

Race, Timothy D., Army Construction Engineering Research Lab., USA; Sep. 1997; 30p; In English

Report No.(s): AD-A329857; USACERL-TR-97/139; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Both aluminum and galvanized steel are used on many Corps of Engineers projects. Civil Works Guide Specification CWGS-09940 specifies coatings for the protection of these nonferrous metal surfaces in various applications, but some of these coatings are no longer in compliance with current or anticipated government restrictions on volatile organic compound (VOC) content. The U.S. Army Construction Engineering Research Laboratories (USACERL) was tasked to study select coating systems and identified alternative materials that can meet CWGS-09940 performance specifications while conforming to regulatory VOC content levels. Alternatives were to be sought from commercially available products or existing Federal Specification paints in order to conform with current Federal acquisition reform initiatives. The performance of selected test and control coatings was evaluated on aluminum and galvanized steel surfaces in laboratory tests including fresh water immersion and accelerated cyclic corrosion exposures. Exposed test panels were evaluated for adhesion, blistering, delamination, undercutting at the scribe, and corrosion. The research identified several suitable commercially available alternative coatings for nonferrous metal surfaces used in various environmental exposures. Based on the results of this study, revisions of CWGS-09940 are recommended.

DTIC

*Protective Coatings; Metal Surfaces; Corrosion; Steels; Surface Properties; Functional Design Specifications; Nonferrous Metals; Organic Compounds; Water Immersion; Adhesion*

**19980006138** National Inst. of Standards and Technology, Ceramics Div., Gaithersburg, MD USA

**Mechanical Properties of Aluminum Nitride Substrates**

Wallace J. S., National Inst. of Standards and Technology, USA; Fuller, R., National Inst. of Standards and Technology, USA; Freiman, W., National Inst. of Standards and Technology, USA; Dec. 1996; In English

Report No.(s): PB97-132039; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Aluminum nitride (AlN), because of its high thermal conductivity, is seeing increased use for heat management applications of semiconductor devices. With the likelihood of large mechanical stresses, mechanical properties become an important aspect of overall device reliability. This report describes the work at NIST to characterize mechanical properties of importance to structural reliability.

Author

*Aluminum Nitrides; Mechanical Properties; Substrates*

**19980006265** China Nuclear Information Centre, Beijing, China

**The study determination of 18 trace impurity elements in nuclear-purity graphite by USN-ICP/AES**

Hou, Lie-Qi, China Nuclear Information Centre, China; Wang, Shu-An, Nuclear Power Inst. of China, China; Li, Jie, China Nuclear Information Centre, China; Dec. 1996; 6p; In Chinese

Report No.(s): CNIC-01115; SINRE-0070; DE97-620061; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Using ultrasonic atomization-inductively coupled/atomic emission spectrometry, the determination of 18 impurity elements in nuclear-purity graphite has been studied experimentally. They are Al, Ca, Cd, Co, Cr, Cu, Fe, In, Li, Mg, Mn, Mo, Ni, Pb, Sn, V, Y and Zn. The measuring limits are from 0.01 to 0.04 ( $\mu\text{g}(\text{center dot})\text{g}(\text{sup } -1)$ ). The recovery rates are between 94.2% to 107.3%. The RSD ( $n = 8$ ) are from 0.82% to 6.4%.

DOE

*Impurities; Trace Elements; Atomic Spectra; Aluminum; Calcium; Cadmium; Cobalt; Chromium; Copper; Iron; Indium; Lithium; Magnesium; Manganese; Nickel*

**19980006284** Massachusetts Univ., Lowell, MA USA

**Evaluation of Alternatives to Chlorinated Solvents for Metal Cleaning**

Thomas, K. B., Massachusetts Univ., USA; Ellenbecker, M., Massachusetts Univ., USA; Mar. 1997; 117p; In English

Contract(s)/Grant(s): CR-821859

Report No.(s): PB97-147946; EPA/600/R-97/032; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This project report details results of investigations into alternatives to chlorinated solvents used for metal degreasing. Three companies participated in this project. The results reported for one company document a situation where the conversion to an aqueous cleaning system had already been implemented. Those for a second company provide real-time information about the conversion from an intermediate solvent to an aqueous system. Finally, results for the third company contribute information about

alternatives that must be applicable to a variety of substrates and configurations. In addition to the technical evaluations, the project report provides financial analyses and environmental impact assessments on the cleaning alternatives. For the financial analyses, the Total Cost Assessment methodology was used which includes many important environmental costs not typically included in a financial analysis. A substitution analysis methodology that provides qualitative results was developed and used to evaluate the environmental, occupational, and public health effects of the alternative cleaning processes.

NTIS

*Alternatives; Chlorination; Damage Assessment; Environmental Surveys; Real Time Operation; Substitutes; Substrates*

**19980006293** General Electric Co., Corporate Research and Development, Schenectady, NY USA

**Non-Toxic, Self Cleaning Silicone Fouling Release Coatings Progress Report, Jul. - Sep. 1997**

Cella, James A., General Electric Co., USA; Oct. 07, 1997; 4p; In English

Contract(s)/Grant(s): N00014-96-C-0145

Report No.(s): AD-A330070; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Attempts to microencapsulate silicone oils for enhanced fouling release coatings with thermoset wall structures were unsuccessful: Microcapsule filled coatings failed abrasion resistance tests and had mediocre fouling release properties, despite having controlled release rates. Microcapsules with an alternative gel cap wall structure have been obtained from Cannon Chemical Co. Q-panels have been prepared in which the gel caps were incorporated into RTV11 at 10% loading and in the J501 tiecoat at 10% loading and have been deployed at FIT for foul release testing. Panels have also been sent to FIT in which capicum has been incorporated into RTV11.

DTIC

*Abrasion Resistance; Guns (Ordnance); Oils; Panels; Silicones; Toxicity; Walls*

**19980006302** NERAC, Inc., Tolland, CT USA

**Ceramic Filters for Casting. (Latest citations from METADEX)**

Dec. 1996; In English; Page count unavailable.

Report No.(s): PB97-852875; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the filtration of molten metals through ceramic filters. The filters separate non-metallic inclusions and slag from the metal, resulting in a cleaner product and enhanced mechanical properties. Filter operation, materials, configuration, and results are presented. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Filtration; Ceramics; Casting; Metals*

## 28

### PROPELLANTS AND FUELS

*Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.*

**19980003914** NERAC, Inc., Tolland, CT USA

**Ammonium Nitrate Explosives (Latest citations from the Energy Science and Technology Database)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851166; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the use of ammonium nitrates as a component for explosives. Articles discuss chemical formulations, reactions, and by-products. Typical applications include quarrying and mining, destruction of industrial wastes, and military and space propellants.

NTIS

*Bibliographies; Chemical Reactions; Energy Technology; Formulations; Industrial Wastes; By-Products; Ammonium Nitrates*

**19980004050** NERAC, Inc., Tolland, CT USA

**Emulsion Explosives. (Latest citations from the U.S. Patent Bibliographic File with Exemplary Claims)**

Nov. 1996; In English; Page count unavailable. Supersedes PB96-855952.

Report No.(s): PB97-851745; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Micro-

fiche

The bibliography contains citations of selected patents concerning the composition, methods, and preparation of emulsion explosives. Topics include emulsion composites; emulsion explosive detonators; and a variety of emulsion explosives, including water-in-oil, gas bubble sensitized, and gelled slurry. Manufacturing processes and transportation methods are included.

NTIS

*Bibliographies; Explosives; Detonators*

**19980004060** NERAC, Inc., Tolland, CT USA

**Aluminized Propellants and Explosives (Latest citations from the US Patent Bibliographic File with Exemplary Claims)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851141; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the compositions and preparations of stable, high energy aluminized propellants and explosives. Compositions include aluminum powders and flakes, aluminum oxides, aluminum hydrides, and whiskers. Patents cover ultra-high burning rate propellants, stabilization of aluminum hydrides, sensitizing agents for explosives, low radar attenuation propellants, and anti-erosive rocket propellants.

NTIS

*Bibliographies; Explosives; Powdered Aluminum; Aluminum Hydrides; Aluminum Oxides; Rocket Propellants; Propellant Additives; High Energy Propellants; Flakes*

**19980004062** NERAC, Inc., Tolland, CT USA

**Electroexplosive Devices (Latest citations from the NTIS Bibliographic Database)**

Nov. 1996; In English; Page count unavailable

Report No.(s): PB97-851091; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, testing, and reliability of electroexplosive devices. Explosive initiators, detonators, and firing circuits are discussed. Topics include dielectrics and semiconductors of various configurations, devices that are immune to radio frequencies, protection against direct currents, and electromagnetic compatibility. Applications in mining and oil drilling, weapon systems, and guided missiles are examined. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Initiators (Explosives); Performance Tests; Design*

**19980004120** Cornell Univ., Ithaca, NY USA

**Optimizing Cellulase Mixtures for Maximum Rate and Extent of Hydrolysis Final Report**

Walker, L. P., Cornell Univ., USA; Wilson, D. B., Cornell Univ., USA; Mar. 1997; 82p; In English

Report No.(s): PB97-159404; Rept-97-6; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In New York State, wood is an abundant and renewable resource. Wood is composed of approximately 50% cellulose. The enzymatic breakdown of cellulose produces wood sugars cleanly and efficiently. These sugars can be fermented into fuels and other energy-intensive chemicals that could decrease New York State's oil dependence. However, the cost of cellulase enzymes needs to be reduced. This report describes the results of a study designed to improve the effectiveness of cellulase enzymes.

NTIS

*Cellulose; Hydrolysis; Ethyl Alcohol*

**19980004607** NERAC, Inc., Tolland, CT USA

**Electroexplosive Devices. (Latest citations from the Ei Compendex\*Plus database)**

Jan. 1997; In English; Page count unavailable. Supersedes PB96-862172

Report No.(s): PB97-854962; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, manufacture, and evaluation of electroexplosive devices. Citations discuss detonation and ignition systems, primers, electric firing circuits, and explosive actuated devices. Coverage includes

devices immune to radio frequency, protection from electrostatic discharge, and spectroscopic analyses of explosives and residues. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Initiators (Explosives)*

**19980004631** NERAC, Inc., Tolland, CT USA

**Deflagration to Detonation Transition in Explosive Materials (Latest citations from the NTIS Bibliographic Database)**

Oct. 1996; In English; Page count unavailable

Report No.(s): PB97-850689; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This bibliography contains citations concerning the propagation of an explosive front in propellants and explosives after ignition. This deflagration-to-detonation transition (DDT), is discussed for a variety of materials, including solids, liquids, and gases. DDT for materials is discussed from the viewpoints of porosity, flame spread, shock wave propagation, pressure rise, crack formation, and crack propagation. Mechanisms and models for DDT are also discussed, as well as applications to devices such as detonators, rockets, and explosive munitions. Propellants and explosives in general are referenced in related published bibliographies. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Deflagration; Bibliographies; Explosives; Detonation*

**19980004710** NERAC, Inc., Tolland, CT USA

**Aviation Fuel Additives: Latest citations from the Energy Science and Technology Database**

May 1997; In English; Page count unavailable, Supersedes PB96-861505.

Report No.(s): PB97-860068; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning research, development, and applications of additives in aviation fuels. The additives consist of the following types: antioxidants, icing inhibitors, corrosion inhibitors, lubricity additives, antimisting additives, and additives for thermal and storage stability. The applications of fuel additives in preventing deposit formation and bacterial growth are also discussed.

NTIS

*Bibliographies; Aircraft Fuels; Additives; Corrosion Prevention; Antioxidants; Storage Stability*

**19980005101** Radian Corp., Austin, TX USA

**Risk Assessment of Converting Salt Caverns to Natural Gas Storage Final Report, Nov. 1994 - Jul. 1995**

Harrison, M. R., Radian Corp., USA; Ellis, P. F., Radian Corp., USA; Oct. 1995; 80p; In English

Report No.(s): PB96-146014; DCN-95-660-213-01; RCN-660-213-09-01; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The objective of this paper was an assessment of the risks of release of large quantities of natural gas from salt caverns converted from other uses to the storage of Compressed Natural Gas (CNG). A total of 22 potential root causes for large releases of natural gas from converted salt caverns were identified and ranked in terms of relative risk. While this project assessed the relative risks of major gas releases, the absolute risk was determined by implication to be extremely low, as indicated by the historical record.

NTIS

*Natural Gas; Underground Storage; Assessments; Compressed Gas; Caves; Sodium Chlorides*

**19980005327** NERAC, Inc., Tolland, CT USA

**Ammonium Nitrate Propellants and Explosives (Latest citations from the US Patent Bibliographic File with Exemplary Claims)**

May 1996; In English; Page count unavailable

Report No.(s): PB96-870761; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the design and manufacture of high performance and low cost ammonium nitrate propellants and explosives. References include emulsion explosives, solid and liquid propellants, prills

and prill processes, fuel oils, additives, binders, and plastizers. Applications cover automotive air bag systems, bore hole explosive devices, space boosters, and gun powders.

NTIS

*Bibliographies; Ammonium Nitrates; Explosives; Liquid Rocket Propellants; Additives; Binders (Materials); Fuel Oils; Powder (Particles)*

**19980006310** Radian Corp., Austin, TX USA

**Guidelines for Implementation and Risk Assessment of Inert Base Gas Projects *Final Report, Oct. 1995 - Apr. 1997***

Ellis, P. F., Radian Corp., USA; Harrison, M. R., Radian Corp., USA; Weiss, W. L., Radian Corp., USA; Apr. 1997; 127p; In English

Report No.(s): PB97-171789; DCN-96-660-213-03; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The report presents a systematic methodology for storage field operators to use in implementing inert base gas projects for underground natural gas storage fields. Step-by-step instructions for performing a detailed risk assessment on an inert base gas project are also provided. The field implementation plan is a four-step approach to plan and implement inert base gas projects for underground natural gas storage fields. The four steps are field pre-screening, field selection, data collection, and engineering analysis. The plan uses risk-based criteria to determine if a particular field is suitable for inert base gas use, and a qualitative risk assessment is performed at each step of the plan development. The detailed risk assessment includes cost/benefit analyses and provides data for insurance (risk transfer or acceptance) decisions.

NTIS

*Natural Gas; Underground Storage; Risk; Rare Gases*